DOCUMENT RESUME

ED 360 559 CE 064 354

TITLE Food Science 7075. Curriculum Guide.
INSTITUTION North Carolina State Dept. of Public Instruction, Raleigh. Div. of Vocational and Technical Education Services.
PUB DATE Aug 93
NOTE 225p.
PUB TYPE Guides - Classroom Use - Teaching Guides (For Teacher) (052)

EDRS PRICE MF01/PC09 Plus Postage.
DESCRIPTORS Behavioral Objectives; *Career Development; *Chemistry; Competence; Competency Based Education; Course Content; Educational Resources; Food; *Foods Instruction; High Schools; Home Economics; Learning Activities; State Curriculum Guides; Teaching Methods; Units of Study
IDENTIFIERS North Carolina

ABSTRACT

This curriculum guide was developed as a resource for teachers to use in planning and implementing a competency-based instructional program on food science in the 11th and 12th grades. It contains materials for a 2-semester course, based on the North Carolina Program of Studies (revised 1992); it is designed to help students learn about the physical and chemical changes that occur during the processing, packaging, and preservation of foods, as well as the many careers in this area. The 12 units cover the following topics: introduction to food science; and evaluation of food, matter, electrolyte solutions, energy, and food chemistry; leadership and citizenship; food mixtures; food microbiology; food preservation; complex food systems; and trends in food science. Units include competencies, objectives, a teaching outline keyed to teaching strategies and learning activities, and suggested resources. Other contents of the guide are as follows: course blueprint; course matrices; content outline; curriculum page layout; and a resource list citing 2 course textbooks, 6 state-adopted textbooks, 26 other books, 15 journal articles, 12 sources of information, 10 filmstrips, 13 videotapes, 5 computer software programs, 3 educational packets, 6 display kits, and 7 sources of supplies and equipment. (KC)

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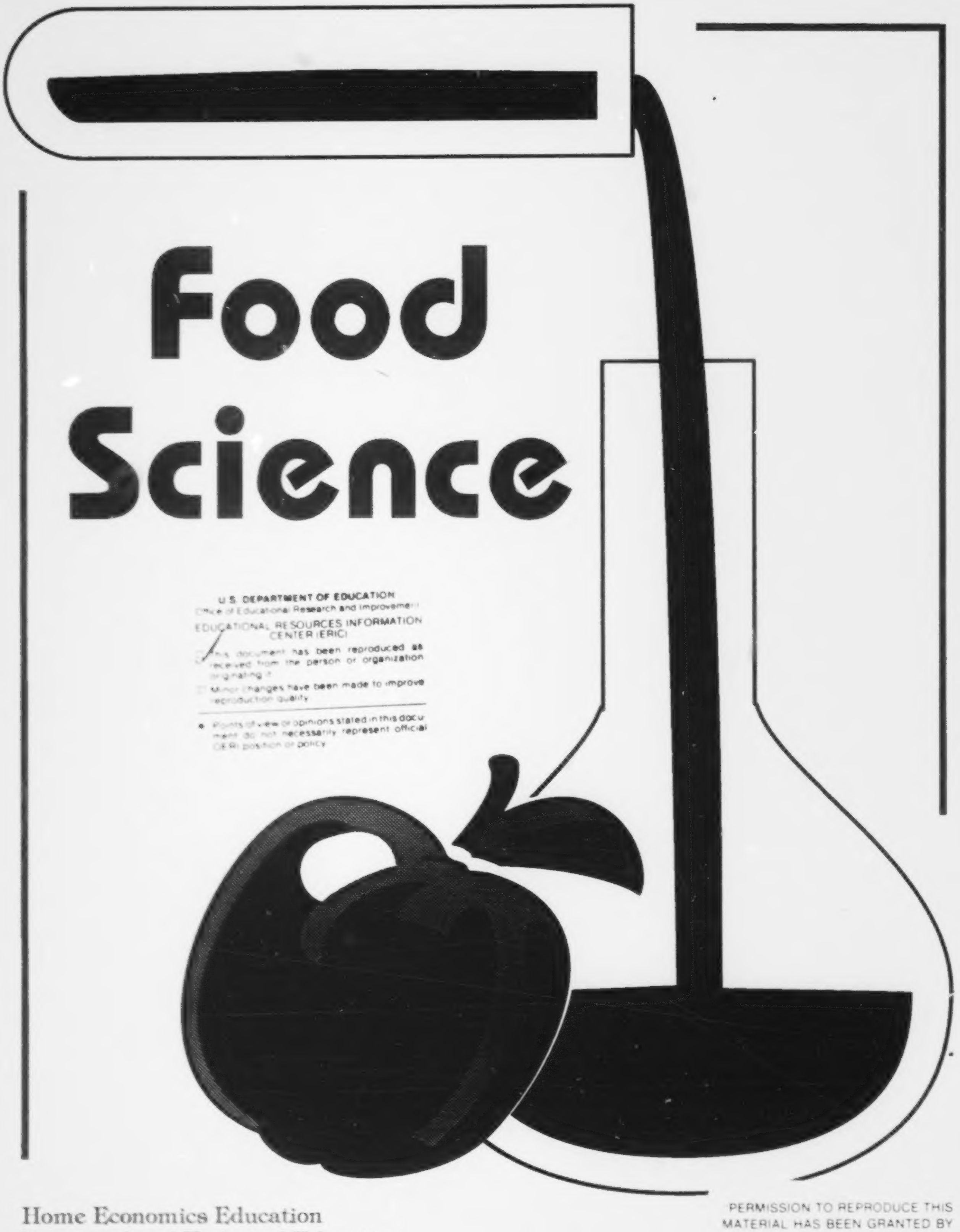

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Home Economics Education
Vocational and Technical Education
North Carolina Department of Public Instruction
Bob Etheridge, Superintendent

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Food Science

7075

Curriculum Guide

Issued by
Home Economics Education
Division of Vocational and Technical Education Services
North Carolina Department of Public Instruction
Raleigh, North Carolina 27601-2825
August 1993

Activities and procedures within the Division of Vocational and Technical Education Services are governed by the philosophy of simple fairness to all. Therefore, the policy of the Division is that all operations will be performed without regard to race, sex, color, national origin, or handicap.

FOREWORD

Food Science is a new course in Home Economics Education that allows students to learn about the physical and chemical changes that occur during the processing, packaging, and preservation of foods, and the many careers in this area. It is an integration of chemistry, biology, physics, nutrition, and psychology.

The *Food Science Curriculum Guide* is specifically designed to teach skills needed to engage in scientific inquiry and problem-solving through hands-on experiences in measuring, recording, graphing data, writing lab reports, and predicting and evaluating experimental results. Students also learn how to apply the theories, laws, and principles to their everyday lives.

This curriculum guide helps students build and strengthen work-place and basic skills. Emphasis is placed on exploring current and emerging science related careers, developing positive work habits, and examining the role of food scientists in the food industry.

We hope this guide will be helpful to you and your students.

Bob Etheridge
State Superintendent of Public Instruction

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ACKNOWLEDGEMENTS

The Division of Vocational and Technical Education Services and the Home Economics Consultant Staff wish to acknowledge Debra Owens Parker for her leadership role in the planning and development of the Food Science Curriculum Guide. Appreciation is also expressed to the many individuals who shared ideas and contributed to the development of this guide.

Special recognition and appreciation is extended to the following individuals who served on the advisory team for the development and evaluation of the curriculum guide and resource materials.

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Nancy White
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Raeford, N.C.

Appreciation is extended to school and university administrators for their cooperation and support for the design of this new course.

Acknowledgments are due Stacey Cheatham of N.C. Manufactured Housing Institute and Sharon D. Mason of Harding High School in Charlotte, N.C. for the cover design.

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USING THE CURRICULUM GUIDE

This *The Food Science Curriculum Guide* was developed as a resource for teachers to use in planning and implementing a competency-based instructional program at a high school level. In addition, strategies incorporate activities fostering basic skills, all aspects of the industry, SCANS, consumer choices, and FHA/HERO.

Food Science is a year-long and semester Consumer Home Economics course offered to students in the eleventh and twelfth grades. The following course description is from the *Program of Studies*, Revised 1992 by the Division of Vocational and Technical Education Services, North Carolina Department of Public Instruction.

COURSE DESCRIPTION

HE 7075 (S-1 OR Y-1) Credit: ½ unit or 1 unit
Grades: 11-12 Maximum Enrollment: 20

Semester I. Students use the scientific method to study the field of food science. Laboratory skills developed in measuring, recording, and analyzing data are used to explore the interrelationship of food science to other sciences, the scientific evaluation of food, matter electrolyte solutions, energy, and food chemistry. Emphasis is placed on careers, leadership, and citizenship.

Semester II. Experimental methods are used to analyze food mixtures, food microbiology, fermentation, the preservation of foods and complex food systems. Students will examine new technology as it relates to product development, consumer needs, and experimental designs. Emphasis is placed on emerging careers in food science and biotechnology.

COURSE BLUEPRINT AND MATRICES

On the following pages are given the course blueprint and matrices. The blueprint was designed to provide the teacher with a scope of the curriculum for Food Science. The blueprint is intended to be used by teachers in developing an annual plan of instruction and calendar of work for the year. It provides the bases for preparing daily lessons plans and for constructing instructionally-valid tests. Shown on the blueprint are the units of instruction, competencies, objectives for each competency, type of behavior, weights, recommended teaching unit times and related skills.

The matrices following the blueprint illustrate the correlation of the textbook to course objectives and the objectives that support basic skills, SCANS, and all aspects of the industry. Definitions of all aspects of the industry and SCANS are provided at the end of matrices.

CURRICULUM PAGE LAYOUT

Note that *CONTINUED* at the top of the page indicates the second or third page of strategies for an objective. Each curriculum page includes the following information:

COURSE: Title of Course.

UNIT: Title of Unit.

COMPETENCY and COMPETENCY NUMBER: Identifies the competency statement and the number based on the course blueprint.

OBJECTIVE and OBJECTIVE NUMBER: Identifies the desired student outcome. Each objective makes a complete statement when combined with the stem "The student will be able to ..." All objectives are in italics. The number identifies the objective according to the unit and competency as provided on the course blueprint.

DAYS: Indicates the suggested time to be used for the specific objective. The number of days is based on the weight given to that objective in VoCATS.

OUTLINE: The content outline provides teachers with a base of information to use in covering each objective. Information reflects the VoCATS test-item bank.

STRATEGIES: Strategies are designed as student strategies and are in addition to the strategies and activities provided in the course texts. **It is NOT intended that each of these strategies be completed.**

BEHAVIOR: Each strategy addresses a specific learning level. Learning levels are classified in one or more of the three domains: cognitive, psychomotor, and affective. Strategy development was based on and dictated by the level at which the objectives were written. For example, if an objective is written at a cognitive level 2 (C2), then all strategies under that objective were written at a level no higher than level 2. Following is a chart illustrating the different learning levels. Symbols used on the curriculum page are identified along with suggestions for types of tests and test items.

Learning Level	Outcome Terms	Types of Tests/Test Items
Cognitive (C) Level 1 C1	Identify Recognize Describe	Single, objective-type, paper and pencil test items such as matching, short answer, listing, completion or fill-in-the-blank, identification selecting from a list, or forced choice
Level 2 C2	Translate Interpret Summarize	Short-answer questions, multiple choice items, essay using case studies, oral items, rank, order, sequencing items.
Level 3 C3	Apply Explain why Analyze Synthesize Adapt Predict Evaluate	Complex multiple-choice items, essay items using case studies/scenarios, structured interviews using case studies, problem-solving items, product performance items.
Psychomotor (P)	Imitate Try or attempt Demonstrate Improvise Experiment	Performance tests to evaluate either the process, task, procedure, operation performed by the student or product created by the student. The teacher or qualified observer will use a detailed checklist during the performance test for evaluation.
Affective (A)	Show awareness Show interest in Pay attention to Follow rules or instruction Engage in Volunteer to Show pleasure or satisfaction Participate in actively Show preference for Initiate and carry out Assume responsibility for	Evaluation of behavior may be reflected through student actions over an extended period of time with before and after measures; complete a rating scale or projective device; respond to a checklist; teacher's recorded observations, oral expression by the student (personal opinion, group interaction); written responses by student (diary lag, projective device, completion of rating scale).

RESOURCES: Resources are listed at the end of the strategies for each objective. Suggested resources are also listed and include books, videos, computer software, and instructional packages.

MATRICES

There are three matrices, each addressing one of the following: all aspects of the industry, basic skills, and course textbooks. These matrices show which of the topics at the top of the matrix is addressed by each objective. For example, if there is a student strategy developed for an objective that deals with a specific topic given in the matrix, then it is indicated by an asterisk (*). Basic information about each matrix is given below.

ALL ASPECTS OF THE INDUSTRY

"All aspects of the industry" means strong experience in, and understanding of, all aspects of the industry the students are preparing to enter, including planning, management, finances, technical and production skills, underlying principles of technology, labor issues, and health and safety, and environmental issues. Definitions for these components are:

Planning: the act of formulating ideas or ambitions into a method for proceeding and accomplishing a goal.

Management: the process of achieving goals by effective use of human resources, technology, and material resources.

Finances: the managing or science of managing money matters or credit.

Technical and production skills: the ability to apply practical or mechanical skills in the process of creating, growing, manufacturing, or improving.

Underlying principles of technology: fundamental laws and facts, scientific knowledge and technical methods to achieve a practical purpose.

Labor issues: points, matters or questions to be disputed or decided concerning wage-earning workers.

Health and safety: the physical and mental well-being or soundness of the body in an environment that allows freedom from danger, injury or damage.

Environmental issues: matter or points of controversy related to the aggregate of all the external conditions, circumstances and influences affecting surroundings, life and its developmental processes.

SCANS

The Secretary's Commission on Achieving Necessary Skills (SCANS) has defined a core of skills that constitute work readiness forthe jobs of today and tomorrow. The know-how identified by SCANS includes five competencies defined as follows:

Resources: the act of allocating time, money, materials, space, and staff;

Interpersonal Skills: working on teams, teaching others, serving customers, leading, negotiating, and working well with people from culturally diverse backgrounds;

Information: acquiring and evaluating data, organizing and maintaining files, interpreting and communicating, and using computers to process information;

Systems: understanding social, organizational, and technological systems, monitoring and correcting performance, and designing or improving systems;

Technology: selecting equipment and tools, applying technology to specific tasks, and maintaining and troubleshooting technologies.

BASIC SKILLS

The items included here are communication, math, science, and social studies. Communication includes oral, reading, writing, and listening skills.

Food Science

Matrices

Basic Skills

SCANS

All Aspects of the Industry

Course Text

Basic Skills

(C)	Communications
(M)	Math
(S)	Science
(SS)	Social Studies

Scans

(R)	Resources
(IP)	Interpersonal Skills
(IF)	Information
(S)	Systems
(T)	Technology

All Aspects of the Industry

(P)	Plan: Planning
(M)	Management
(F)	Finances
(S)	Technical and Production Skills
(T)	Underlying Principles of Technology
(L)	Labor and Community Issues
(H)	Health and Safety
(E)	Environmental Issues

Text

(FS)	Food Science and You

	Food Science	Basic Skills				SCANS					All Aspects of the Industry								Text
#	COURSE OBJECTIVES	C	M	S	SS	R	IP	IF	S	T	P	M	F	S	T	L	H	E	F S
001.01	Explore the field of food science.	•	•	•		•		•			•	•			•		•	•	•
001.02	Explain the interrelationship between food science and other sciences.	•	•	•				•	•			•			•		•	•	•
002.01	Identify entry-level and advanced-level careers in food science.	•				•		•	•		•	•			•	•		•	•
002.02	Examine education and training needed for a career in food science.	•				•		•	•	•	•	•			•	•	•	•	•
003.01	Explain the steps in the scientific method.	•	•	•		•	•	•	•	•	•	•		•	•	•	•	•	•

	Food Science	Basic Skills				SCANS					All Aspects of the Industry							Text
#	COURSE OBJECTIVES	C	M	S	SS	R	IP	IF	S	T	P	M	F	S	T	L	H	E	F S
003.02	Identify the basic units of the metric system of measurement.	•	•	•				•	•			•		•	•				•
003.03	Determine area, volume, weight, mass, and density.	•	•	•		•	•	•	•	•	•	•		•	•			•	•
003.04	Interpret symbols, formulas, and equations.	•	•	•		•	•	•	•			•		•	•		•	•	•
003.05	Write accurate and complete reports of food science experiments.	•	•	•		•	•	•	•	•	•	•		•	•		•		•
004.01	Identify scientific equipment used in the food science laboratory.	•		•		•		•	•	•	•	•		•	•				•
004.02	Demonstrate the proper use and care of scientific equipment.	•	•	•		•	•	•	•	•	•	•		•	•		•	•	•
004.03	Describe safety guidelines in the laboratory.	•		•		•	•		•	•	•	•		•	•		•	•	•
005.01	Explore sensory evaluation.	•			•	•	•	•	•		•	•		•	•	•	•	•	•
005.02	Determine factors that affect food preferences.	•			•		•		•	•				•	•		•	•	•
006.01	Distinguish between elements, compounds, and mixtures.	•	•	•		•	•		•	•	•	•		•	•			•	•
006.02	Examine the structure of atoms and molecules.	•		•				•	•		•			•	•			•	•
006.03	Explain the differences between ionic and covalent bonds and ionic and covalent compounds.	•		•		•		•	•	•				•	•			•	•
007.01	Differentiate between chemical and physical changes in foods.	•		•		•		•	•					•	•	•	•	•	•
007.02	Demonstrate physical and chemical changes in food.	•		•		•	•	•	•	•		•		•	•		•		•
008.01	Explain how ionization relates to the formation of acids and bases.	•		•				•	•	•				•	•				•
008.02	Analyze the properties of acids and bases.	•		•		•	•	•	•	•	•	•		•	•				•
009.01	Discuss the importance of pH in digestion.	•		•		•	•	•	•		•	•		•	•		•	•	•

	Food Science	Basic Skills				SCANS					All Aspects of the Industry								Text
#	COURSE OBJECTIVES	C	M	S	SS	R	IP	IF	S	T	P	M	F	S	T	L	H	E	FS
009.02	Determine the pH of common foods.	•		•		•	•	•	•		•	•		•	•		•	•	•
010.01	Explore the relationship between energy, physical changes and chemical reactions.	•		•		•	•	•	•	•	•	•		•	•		•	•	•
010.02	Examine the relationship between molecular motion and temperature.	•		•		•	•	•	•		•	•		•	•			•	•
011.01	Discuss food components that the body uses for energy.	•		•		•	•		•	•	•	•		•	•		•		•
011.02	Determine factors that affect how the body uses energy.	•		•		•	•		•	•	•	•		•	•		•	•	•
012.01	Explain the properties of water.	•		•		•	•	•	•		•	•		•	•		•	•	•
012.02	Describe how hydrogen bonding differs from covalent bonds.	•		•		•	•	•		•	•	•		•	•				•
012.03	Explain heat of fusion and heat of vaporization.	•		•		•	•	•			•	•		•	•				•
013.01	Identify the chemical structure of simple and complex carbohydrates.	•		•				•	•					•	•		•	•	•
013.02	Explain the functions of sugar, starch, and pectin in food systems.	•		•		•	•	•	•	•	•	•		•	•		•	•	•
014.01	Compare the properties of saturated and unsaturated fatty acids.	•		•		•	•	•	•	•	•	•		•	•		•	•	•
014.02	Investigate the effects of fat in food preparation.	•		•		•	•		•		•	•		•	•		•	•	•
014.03	Explain how oxidations can be controlled in foods.	•		•		•	•	•	•	•	•	•		•	•		•		•
015.01	Identify the chemical structure of protein and amino acids.	•		•				•	•		•	•		•	•		•	•	•
015.02	Explain what causes denaturation.	•		•		•	•	•	•		•	•		•	•		•	•	•
015.03	Describe ways in which protein is used in food products.	•		•		•	•	•	•	•	•	•		•	•		•		•
016.01	Describe how enzymes act as catalysts in chemical reactions.	•		•				•	•	•				•	•		•	•	•

	Food Science	Basic Skills				SCANS					All Aspects of the Industry								Text
#	COURSE OBJECTIVES	C	M	S	SS	R	IP	IF	S	T	P	M	F	S	T	L	H	E	F S
016.02	Identify factors that affect enzyme activity.	•		•		•	•	•	•	•	•	•		•	•		•	•	•
016.03	Explain how enzyme reactions are involved in food production.	•		•		•	•	•	•	•	•	•		•	•		•		•
017.01	Discuss the interrelationship between vitamins and minerals in food preparation.	•		•		•		•			•	•		•			•	•	•
017.02	Explore the effects of heat, light, and pH on the stability of vitamins and minerals.	•		•		•	•	•	•	•	•	•		•	•		•	•	•
018.01	Explore the use of additives in foods.	•		•		•	•	•			•	•		•	•		•	•	•
018.02	Explain the role of governmental regulations regarding food additives.	•		•				•	•	•				•	•	•	•	•	•
019.01	Use information to determine group action.	•			•	•	•	•			•	•	•	•					
019.02	Use interpersonal communication skills to accomplish group goals.	•			•	•	•	•			•	•	•	•					
019.03	Manage resources to achieve group goals.	•			•	•	•	•			•	•	•	•					
020.01	Examine organizational rules.	•			•	•	•	•	•		•	•		•					
020.02	Demonstrate handling organizational business.	•			•	•	•	•			•	•	•	•					
021.01	Identify the solvent and solute in a given substance.	•		•		•	•	•	•		•	•		•			•	•	•
021.02	Analyze the effects of concentrations on the physical properties of solutions.	•		•		•	•	•	•	•	•	•		•	•	•	•	•	•
021.03	Examine the properties of colloidal dispersions.	•		•		•	•	•	•	•	•	•		•	•		•	•	•
022.01	Identify examples of gels, foams, and emulsions.	•		•				•						•					•
022.02	Determine the role of gels, foams, and emulsions in foods.	•		•		•	•	•	•	•	•	•		•	•	•	•	•	•
023.01	Explain the function and properties of natural and chemical leavening agents.	•		•		•	•	•	•		•	•		•			•	•	•
023.02	Compare the effects of chemical and natural leavening agents on baked products.	•		•		•	•	•	•		•	•		•			•	•	•

	Food Science	Basic Skills				SCANS					All Aspects of the Industry								Text
#	COURSE OBJECTIVES	C	M	S	SS	R	IP	IF	S	T	P	M	F	S	T	L	H	E	FS
024.01	Identify the four types of organisms.	•		•		•		•	•					•	•		•	•	•
024.02	Identify the positive and negative effects of yeasts, molds, bacteria, and viruses in foods.	•		•				•	•	•				•			•	•	•
025.01	Identify organisms that cause food spoilage.	•		•				•	•	•				•	•		•	•	•
025.02	Explain how growth of microorganisms can be minimized to prevent food spoilage.	•		•				•	•	•		•		•	•		•	•	•
026.01	Differentiate between food-borne infections, intoxications, and toxicoinfections.	•		•				•	•	•				•	•		•	•	•
026.02	Compare the bacteria populations in foods.	•		•		•	•	•	•		•	•		•			•	•	•
026.03	Differentiate between cleaning and sanitizing.	•		•		•		•	•		•	•		•			•	•	•
026.04	Examine safe food handling practices.	•		•		•	•	•	•	•	•	•		•	•		•	•	•
026.05	Describe the role of federal, state, and local agencies in regulating food safety standards.	•		•		•	•	•	•		•	•				•	•	•	•
027.01	Describe mold, yeast, and bacterial fermentations.	•		•		•		•	•					•			•	•	•
027.02	Explore how various factors affect fermentations.	•		•		•	•	•	•	•	•	•		•	•		•	•	•
027.03	Explain why fermentations preserve foods.	•		•		•	•	•	•	•	•	•		•	•		•	•	•
028.01	Identify the purposes of dehydration.	•		•		•		•		•	•	•		•	•		•	•	•
028.02	Explain the dehydration process.	•		•		•	•	•	•	•	•	•		•	•		•	•	•
028.03	Explore the role of sublimation in freeze-drying.	•		•		•	•	•	•		•	•		•			•	•	•
029.01	Discuss the role of blanching in freezing vegetables.	•		•				•	•	•				•	•		•	•	•
029.02	Explore the factors that affect the storage of frozen foods.	•		•		•	•	•	•	•	•	•		•	•		•	•	•
030.01	Explain the two methods of processing home-canned foods.	•		•		•		•	•					•		•	•	•	•
030.02	Compare regular retort canning and aseptic canning.	•		•		•	•	•	•	•	•	•		•	•	•	•	•	•

	Food Science	Basic Skills				SCANS					All Aspects of the Industry								Text
#	COURSE OBJECTIVES	C	M	S	SS	R	IP	IF	S	T	P	M	F	S	T	L	H	E	F S
031.01	Describe the process of food irradiation and its effects on food.	•		•				•	•	•				•	•	•	•		•
031.02	Investigate the effect the Delaney clause has had on the irradiated food industry.	•		•		•	•	•	•	•	•	•			•	•	•	•	•
032.01	Identify examples of preservatives.	•		•		•		•		•				•	•		•	•	•
032.02	Discuss the role of chemical preservatives in preventing food spoilage.	•		•		•		•	•	•				•	•		•	•	•
033.01	Examine the various components of a complex food system.	•		•		•	•	•	•	•	•	•	•	•	•	•	•	•	•
033.02	Discuss how the components affect food preparation.	•		•		•		•	•	•	•	•		•	•		•	•	•
034.01	Identify by-products of complex foods.	•		•				•	•	•				•	•		•	•	•
034.02	Analyze the process used to create by-products from a complex food.	•		•		•	•	•	•	•	•	•		•			•	•	•
035.01	Explore emerging careers in food science and biotechnology.	•		•	•	•	•	•	•	•	•	•		•	•	•	•	•	•
035.02	Research new technology as it relates to product development and consumer needs.	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
036.01	Use the scientific method to develop a procedure for an experiment.	•	•	•		•	•	•	•	•	•	•		•	•	•	•	•	•
036.02	Conduct a food science experiment.	•	•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•
036.03	Present experimental findings to the class.	•		•		•	•	•	•	•	•	•	•	•	•	•	•	•	•

VoCATS
Course Blueprint

Home Economics Education

Course Name: Food Science (Year)
Course Number: 7075

North Carolina Department of Public Instruction
Bob Etheridge, State Superintendent

Division of Vocational and Technical Education Services
Home Economics Education
Raleigh, North Carolina **Summer 1993**

6/30/93

VoCATS Course Blueprint

A course blueprint is a document laying out the scope of the curriculum for a given course/program.
Shown on the blueprint are the units of instruction, the core competencies in each unit, and the specific objectives for each competency.
The blueprint illustrates the recommended sequence of the units and competencies, the weight or relative importance of the objective within the course or unit, and the recommended number of hours to be devoted to each.
The blueprint is intended to be used by teachers in planning the course of work for the year, preparing daily lesson plans, and constructing instructionally valid tests.
The material that appears in this blueprint replaces the contents of the Teacher Handbook developed in 1985.
For additional information about this blueprint, contact program area staff. For additional information about the Vocational Competency Achievement Tracking System, contact program area staff or the Program Support Unit, Division of Vocational and Technical Education Services, 301 North Wilmington Street, Raleigh, North Carolina 27601-2825 919/715-1675.

Interpretation of Columns on VoCATS Course Blueprints

No.	Heading	Column Information
1	Comp# Obj.#	Comp=Competency number (three digits); Obj=Objective number (competency number plus two-digit objective number).
2	Unit Titles/ Competency and Objective Statements	Statements of unit titles, competencies per unit, and specific objectives per competency. Each competency statement or specific objective begins with an action verb and makes a complete sentence when combined with the stem "The student will be able to. . ." (The stem appears once in Column 11.) Outcome behavior in each competency/objective statement is denoted by the verb plus its object.
3	Time Hrs	Shows **suggested** amount of time needed for instruction and learning. For example, 2.5 is read as 2 1/2 hours.
4	UNIT Weight	A percentage indicates the relative importance or weight of each competency within a specific unit or each objective within a specific unit. Information in Column 4 is used to plan the yearly calendar of work and as a Test Blueprint for interim tests.
5	COURSE Weight	A percentage indicates the relative importance or weight of each unit within the total course or program, each competency within the total course or program, or each objective within the total course or program. Information in Column 5 is used to plan the yearly calendar of work and as a Test Blueprint for pretests and posttests.
6	Type Behavior	Classification of outcome behavior in competency and objective statements. (C=Cognitive; P=Psychomotor; A=Affective.)
7	Integrated Skill Area	Integrated Skills codes: A=Arts; C=Communications; H=Health/Safety; M=Math; SC=Science; SS=Social Studies.
8	Core Supp	Designation of the competencies and objectives as Core or Supplemental. Competencies and objectives designated Core must be included in the yearly calendar of work.

Activities and procedures within the Division of Vocational and Technical Education Services are governed by the philosophy of simple fairness to all. Therefore, the policy of the Division is that all operations will be performed without regard to race, sex, color, national origin or handicap.

HOME ECONOMICS EDUCATION
COURSE BLUEPRINT for 7075 (CIP#19.0502): FOOD SCIENCE
(Course length: 1 Year; Class Length: 1 period)

Comp# Obj #	Unit Titles / Competency and Objective Statements (The student will be able to:)	Time Hrs.	UNIT Weight	COURSE Weight	Type Behavior	Integrated Skill Area	Core Supp
1	2	3	4	5	6	7	8
		180		100%			
	SEMESTER I	90		50%			
A	**INTRODUCTION TO FOOD SCIENCE**	**4**	**100%**	**4%**			
001.00	**Investigate the study of food science.**	**2**	**50%**	**2%**	**C3**	**CIMISC**	**Core**
001.01	*Explore the field of food science.*	*1*	*25%*	*1%*	*C3*	*CIMISC*	*Core*
001.02	*Explain the interrelationship between food science and other sciences.*	*1*	*25%*	*1%*	*C2*	*CIMISC*	*Core*
002.00	**Explore career opportunities in food science.**	**2**	**50%**	**2%**	**C3**	**C**	**Core**
002.01	*Identify entry-level and advanced-level careers in food science.*	*1*	*25%*	*1%*	*C1*	*C*	*Core*
002.02	*Examine education and training needed for a career in food science.*	*1*	*25%*	*1%*	*C3*	*C*	*Core*
B	**EVALUATION OF FOOD**	**14**	**100%**	**10%**			
003.00	**Apply scientific procedures in collecting, observing, recording, and analyzing data.**	**8**	**58%**	**5%**	**C3P**	**CIMISC**	**Core**
003.01	*Explain the steps in the scientific method.*	*2*	*15%*	*1%*	*C2*	*CIMISC*	*Core*
003.02	*Identify the basic units of the metric system of measurement.*	*2*	*15%*	*1%*	*C1*	*CIMISC*	*Core*
003.03	*Determine area, volume, weight, mass, and density.*	*1*	*7%*	*1%*	*C3*	*CIMISC*	*Core*
003.04	*Interpret symbols, formulas, and equations.*	*1*	*7%*	*1%*	*C2*	*CIMISC*	*Core*
003.05	*Write accurate and complete reports of food science experiments.*	*2*	*14%*	*1%*	*C3P*	*CIMISC*	*Core*
004.00	**Use scientific equipment.**	**3**	**21%**	**3%**	**C3P**	**CIHIMISC**	**Core**
004.01	*Identify scientific equipment used in the food science laboratory.*	*1*	*7%*	*1%*	*C1*	*CISC*	*Core*
004.02	*Demonstrate the proper use and care of scientific equipment.*	*1*	*7%*	*1%*	*C3P*	*CIHIMISC*	*Core*
004.03	*Describe safety guidelines in the laboratory.*	*1*	*7%*	*1%*	*C1*	*CIHISC*	*Core*

14

3

30

1	2	3	4	5	6	7	8
005.00	**Evaluate foods using the sensory process.**	**3**	**21%**	**2%**	**C3P**	**CISS**	**Core**
005.01	*Explore sensory evaluation.*	*2*	*14%*	*1%*	*C3P*	*CISS*	*Core*
005.02	*Determine factors that affect food preferences.*	*1*	*7%*	*1%*	*C3*	*CISS*	*Core*
C	**MATTER**	**6**	**100%**	**5%**			
006.00	**Demonstrate a working knowledge of basic science principles.**	**4**	**67%**	**3%**	**C3P**	**CIMISC**	**Core**
006.01	*Distinguish between elements, compounds, and mixtures.*	*2*	*33%*	*1%*	*C3*	*CISC*	*Core*
006.02	*Examine the structure of atoms and molecules.*	*1*	*17%*	*1%*	*C3P*	*CIMISC*	*Core*
006.03	*Explain the differences between ionic and covalent bonds and ionic and covalent compounds.*	*1*	*17%*	*1%*	*C3*	*CISC*	*Core*
007.00	**Investigate the relationship between matter and foods.**	**2**	**33%**	**2%**	**C3P**	**CISC**	**Core**
007.01	*Differientiate between chemical and physical changes in foods.*	*1*	*16%*	*1%*	*C3*	*CISC*	*Core*
007.02	*Demonstrate physical and chemical changes in food.*	*1*	*17%*	*1%*	*C3P*	*CISC*	*Core*
D	**ELECTROLYTE SOLUTIONS - ACIDS AND BASES**	**7**	**100%**	**4%**			
008.00	**Explore the role of acids and bases in foods.**	**4**	**57%**	**2%**	**C3P**	**CISC**	**Core**
008.01	*Explain how ionization relates to the formation of acids and bases.*	*1*	*14%*	*1%*	*C2*	*CISC*	*Core*
008.02	*Analyze the properties of acids and bases.*	*3*	*43%*	*1%*	*C3P*	*CISC*	*Core*
009.00	**Examine the pH scale and how it is used.**	**3**	**43%**	**2%**	**C3P**	**CISC**	**Core**
009.01	*Discuss the importance of pH in digestion.*	*1*	*14%*	*1%*	*C2*	*CISC*	*Core*
009.02	*Determine the pH of common foods.*	*2*	*29%*	*1%*	*C3P*	*CISC*	*Core*
E	**ENERGY**	**7**	**100%**	**4%**			
010.00	**Investigate how energy is released and absorbed through physical and chemical changes.**	**5**	**71%**	**2%**	**C3P**	**CISC**	**Core**
010.01	*Explore the relationship between energy, physical changes, and chemical reactions.*	*3*	*43%*	*1%*	*C3P*	*CISC*	*Core*
010.02	*Examine the relationship between molecular motion,and temperature.*	*2*	*28%*	*1%*	*C3P*	*CISC*	*Core*
011.00	**Examine the relationship between food intake and body weight.**	**2**	**29%**	**2%**	**C3**	**CISC**	**Core**
011.01	*Discuss food components that the body uses for energy.*	*1*	*14%*	*1%*	*C2*	*CISC*	*Core*
011.02	*Determine factors that affect how the body uses energy.*	*1*	*15%*	*1%*	*C3*	*CISC*	*Core*

1	2	3	4	5	6	7	8
F	**FOOD CHEMISTRY**	**42**	**100%**	**18%**			
012.00	**Summarize the properties and uses of water.**	**7**	**17%**	**3%**	**C2**	**CISC**	**Core**
012.01	*Explain the properties of water.*	*4*	*9 %*	*1 %*	*C2*	*CISC*	*Core*
012.02	*Describe how hydrogen bonding differ from covalent bonds.*	*1*	*2 %*	*1 %*	*C1*	*CISC*	*Core*
012.03	*Explain heat of fusion and heat of vaporization.*	*2*	*6 %*	*1 %*	*C2*	*CISC*	*Core*
013.00	**Explain the importance of carbohydrates in foods.**	**6**	**14%**	**2%**	**C2**	**CISC**	**Core**
013.01	*Identify the chemical structure of simple and complex carbohydrates.*	*2*	*5 %*	*1 %*	*C1*	*CISC*	*Core*
013.02	*Explain the functions of sugar, starch, and pectin in food systems.*	*4*	*9 %*	*1 %*	*C2*	*CISC*	*Core*
014.00	**Explore the importance of lipids in foods.**	**7**	**17%**	**3%**	**C3**	**CISC**	**Core**
014.01	*Compare the properties of saturated and unsaturated fatty acids.*	*2*	*5 %*	*1 %*	*C3*	*CISC*	*Core*
014.02	*Investigate the effects of fat in food preparation.*	*4*	*10%*	*1 %*	*C3*	*CISC*	*Core*
014.03	*Explain how oxidation can be controlled in foods.*	*1*	*2 %*	*1 %*	*C2*	*CISC*	*Core*
015.00	**Summarize the importance of protein in foods.**	**6**	**14%**	**3%**	**C2**	**CISC**	**Core**
015.01	*Identify the chemical structure of protein and amino acids.*	*1*	*2 %*	*1 %*	*C1*	*CISC*	*Core*
015.02	*Explain what causes denaturation.*	*2*	*5 %*	*1 %*	*C2*	*CISC*	*Core*
015.03	*Describe ways in which protein is used in food products.*	*3*	*7 %*	*1 %*	*C1*	*CISC*	*Core*
016.00	**Discuss the role of enzyme reactions in food products.**	**7**	**17%**	**3%**	**C2**	**CISC**	**Core**
016.01	*Describe how enzymes act as catalysts in chemical reactions.*	*2*	*4 %*	*1 %*	*C1*	*CISC*	*Core*
016.02	*Identify factors that affect enzyme activity*	*3*	*8 %*	*1 %*	*C1*	*CISC*	*Core*
016.03	*Explain how enzyme reactions are involved in food production.*	*2*	*5 %*	*1 %*	*C2*	*CISC*	*Core*
17.00	**Analyze the functions of minerals and vitamins in the body.**	**5**	**12%**	**2%**	**C3**	**CISC**	**Cor0**
017.01	*Discuss the interrelationship between vitamins and minerals in food preparation.*	*2*	*5 %*	*1 %*	*C2*	*CISC*	*Core*
017.02	*Explore the effects of heat, light, and pH on the stability of vitamins and minerals.*	*3*	*7 %*	*1 %*	*C3*	*CISC*	*Core*
018.00	**Evaluate the use of additives in foods.**	**4**	**9%**	**2%**	**C3**	**CISC**	**Core**
018.01	*Explore the use of additives in foods.*	*3*	*7 %*	*1 %*	*C3*	*CISC*	*Core*
018.02	*Explain the role of governmental regulations regarding food additives.*	*1*	*2 %*	*1 %*	*C2*	*CISC*	*Core*

1	2	3	4	5	6	7	8
G	**LEADERSHIP AND CITIZENSHIP**	**10**	**100%**	**5%**			
019.00	**Work with others informally to accomplish group goals.**	**6**	**60%**	**3%**	**C3P**	**CISS**	**Core**
019.01	*Use information to determine group action.*	*2*	*20%*	*1%*	*C3P*	*CISS*	*Core*
019.02	*Use interpersonal communication skills to accomplish group goals.*	*2*	*20%*	*1%*	*C3P*	*CISS*	*Core*
019.03	*Manage resources to achieve group goals.*	*2*	*20%*	*1%*	*C3P*	*CISS*	*Core*
020.00	**Use parliamentary law to accomplish group goals.**	**4**	**40%**	**2%**	**C3P**	**CISS**	**Core**
020.01	*Examine organizational rules.*	*2*	*20%*	*1%*	*C3*	*CISS*	*Core*
020.02	*Demonstrate handling organizational business.*	*2*	*20%*	*1%*	*C3P*	*CISS*	*Core*
	SEMESTER II	**90**		**50%**			
H	**FOOD MIXTURES**	**17**	**100%**	**10%**			
021.00	**Explore mixtures in food products and preparation.**	**8**	**47%**	**4%**	**C3**	**CISC**	**Core**
021.01	*Identify the solvent and solute in a given substance.*	*2*	*12%*	*1%*	*C1*	*CISC*	*Core*
021.02	*Analyze the effects of concentrations on the physical properties of solutions.*	*4*	*24%*	*2%*	*C3*	*CISC*	*Core*
021.03	*Examine the properties of colloidal dispersions.*	*2*	*11%*	*1%*	*C3*	*CISC*	*Core*
022.00	**Examine the use of gels, foams, and emulsions in food.**	**3**	**18%**	**2%**	**C3**	**CISC**	**Core**
022.01	*Identify examples of gels, foams, and emulsions.*	*1*	*6%*	*1%*	*C1*	*CISC*	*Core*
022.02	*Determine the role of gels, foams, and emulsions in foods.*	*2*	*12%*	*1%*	*C3*	*CISC*	*Core*
023.00	**Evaluate the effects of leavening agents on baked goods.**	**6**	**35%**	**4%**	**C3**	**CISC**	**Core**
023.01	*Explain the function and properties of natural and chemical leavening agents.*	*3*	*18%*	*2%*	*C2*	*CISC*	*Core*
023.02	*Compare the effects of chemical and natural leavening agents on baked products.*	*3*	*17%*	*2%*	*C3*	*CISC*	*Core*
I	**FOOD MICROBIOLOGY**	**25**	**100%**	**16%**			
024.00	**Describe microorganisms in foods.**	**4**	**16%**	**3%**	**C1**	**CISC**	**Core**
024.01	*Identify the four types of organisms.*	*1*	*4%*	*1%*	*C1*	*CISC*	*Core*
024.02	*Identify the positive and negative effects of yeasts, molds, bacteria, and viruses in foods.*	*3*	*12%*	*2%*	*C1*	*CISC*	*Core*
025.00	**Discuss factors that cause microbial spoilage.**	**4**	**16%**	**3%**	**C2**	**CISC**	**Core**
025.01	*Identify organisms that cause food spoilage.*	*1*	*4%*	*1%*	*C1*	*CISC*	*Core*

1	2	3	4	5	6	7	8
025.02	*Explain how growth of microorganisms can be minimized to prevent food spoilage.*	*3*	*12%*	*2%*	*C2*	*CISC*	*Core*
026.00	**Analyze principles of food safety.**	**10**	**40%**	**7%**	**C3**	**CISCIH**	**Core**
026.01	*Differentiate between food-borne infections, intoxications, and toxico-infections.*	*2*	*8%*	*2%*	*C3*	*CISCIH*	*Core*
026.02	*Compare the bacteria populations in foods.*	*2*	*8%*	*1%*	*C3*	*CISCIH*	*Core*
026.03	*Differentiate between cleaning and sanitizing.*	*1*	*4%*	*1%*	*C3*	*CISCIH*	*Core*
026.04	*Examine safe food handling practices.*	*3*	*12%*	*2%*	*C3*	*CISCIH*	*Core*
026.05	*Describe the role of federal, state, and local agencies in regulating food safety standards.*	*2*	*8%*	*1%*	*C1*	*CISCIH*	*Core*
027.00	**Explore the role of fermentation in food science.**	**7**	**28%**	**3%**	**C3**	**CISC**	**Core**
027.01	*Describe mold, yeast, and bacterial fermentation.*	*2*	*8%*	*1%*	*C1*	*CISC*	*Core*
027.02	*Explore how various factors affect fermentations.*	*3*	*12%*	*1%*	*C3*	*CISC*	*Core*
027.03	*Explain why fermentations preserve foods.*	*2*	*8%*	*1%*	*C3*	*CISC*	*Core*
J	**FOOD PRESERVATION**	**24**	**100%**	**13%**			
028.00	**Determine the value of dehydration as a method of food preservation.**	**8**	**33%**	**4%**	**C3**	**CISC**	**Core**
028.01	*Identify the purposes of dehydration.*	*1*	*4%*	*1%*	*C1*	*CISC*	*Core*
028.02	*Explain the dehydration process.*	*5*	*21%*	*2%*	*C2*	*CISC*	*Core*
028.03	*Explore the role of sublimation in freeze-drying.*	*2*	*8%*	*1%*	*C3*	*CISC*	*Core*
029.00	**Evaluate freezing as a method of food preservation.**	**4**	**17%**	**2%**	**C3**	**CISC**	**Core**
029.01	*Discuss the role of blanching in freezing vegetables.*	*1*	*4%*	*1%*	*C2*	*CISC*	*Core*
029.02	*Explore the factors that affect the storage of frozen foods.*	*3*	*13%*	*1%*	*C3*	*CISC*	*Core*
030.00	**Evaluate canning as a preservation method.**	**5**	**21%**	**2%**	**C3**	**CISC**	**Core**
030.01	*Explain the two methods of processing home-canned foods.*	*2*	*8%*	*1%*	*C2*	*CISC*	*Core*
030.02	*Compare regular retort canning and aseptic canning.*	*3*	*13%*	*1%*	*C3*	*CISC*	*Core*
031.00	**Evaluate irradiation as a method of food preservation.**	**4**	**17%**	**3%**	**C3**	**CISC**	**Core**
031.01	*Describe the process of food irradiation and its effects on food.*	*2*	*8%*	*2%*	*C1*	*CISC*	*Core*
031.02	*Investigate the effect the Delaney clause has had on the irradiated food industry.*	*2*	*9%*	*1%*	*C3*	*CISC*	*Core*

1	2	3	4	5	6	7	8
032.00	**Explain the role of preservatives.**	**3**	**12%**	**2%**	**C2**	**CISC**	**Core**
032.01	*Identify examples of preservatives.*	*1*	*4 %*	*1 %*	*C1*	*CISC*	*Core*
032.02	*Discuss the role of chemical preservatives in preventing food spoilage.*	*2*	*8 %*	*1 %*	*C2*	*CISC*	*Core*
K	COMPLEX FOOD SYSTEMS	10	100%	5 %			
033.00	**Explore a complex food system.**	**5**	**50%**	**2%**	**C3**	**CISC**	**Core**
033.01	*Examine the various components of a complex food system.*	*2*	*20%*	*1 %*	*C3*	*CISC*	*Core*
033.02	*Discuss how the components affect food preparation.*	*3*	*30%*	*1 %*	*C2*	*CISC*	*Core*
034.00	**Examine by-products of complex foods.**	**5**	**50%**	**3%**	**C3**	**CISC**	**Core**
034.01	*Identify by-products of complex foods.*	*1*	*10%*	*1 %*	*C1*	*CISC*	*Core*
034.02	*Analyze the process used to create by-products from a complex food.*	*4*	*40%*	*2 %*	*C3*	*CISC*	*Core*
L	TRENDS IN FOOD SCIENCE	14	100%	6 %			
035.00	**Investigate emerging trends in food science.**	**6**	**43%**	**3%**	**C3**	**CIMISCISS**	**Core**
035.01	*Examine emerging careers in food science and biotechnology.*	*3*	*21%*	*2 %*	*C3*	*CISCISS*	*Core*
035.02	*Research new technology as it relates to product development and consumer needs*	*3*	*22%*	*1 %*	*C3*	*CIMISCISS*	*Core*
036.00	**Develop experiments in food science.**	**8**	**57%**	**3%**	**C3P**	**CIMISC**	**Core**
036.01	*Use the scientific method to develop a procedure for an experiment.*	*2*	*15%*	*1 %*	*C3P*	*CIMISC*	*Core*
036.02	*Conduct a food science experiment.*	*3*	*21%*	*1 %*	*C3P*	*CIMISC*	*Core*
036.03	*Present experimental findings to the class.*	*3*	*21%*	*1 %*	*C3P*	*CISC*	*Core*

VoCATS
Course Blueprint

Home Economics Education

Course Name: Food Science (Semester)
Course Number: 7075

North Carolina Department of Public Instruction
Bob Etheridge, State Superintendent

Division of Vocational and Technical Education Services
Home Economics Education
Raleigh, North Carolina **Summer 1993**

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3	Time Hrs	Shows **suggested** amount of time needed for instruction and learning. For example, 2.5 is read as 2 1/2 hours.
4	UNIT Weight	A percentage indicates the relative importance or weight of each competency within a specific unit or each objective within a specific unit. Information in Column 4 is used to plan the yearly calendar of work and as a Test Blueprint for interim tests.
5	COURSE Weight	A percentage indicates the relative importance or weight of each unit within the total course or program, each competency within the total course or program, or each objective within the total course or program. Information in Column 5 is used to plan the yearly calendar of work and as a Test Blueprint for pretests and posttests.
6	Type Behavior	Classification of outcome behavior in competency and objective statements. (C=Cognitive; P=Psychomotor; A=Affective.)
7	Integrated Skill Area	Integrated Skills codes: A=Arts; C=Communications; H=Health/Safety; M=Math; SC=Science; SS=Social Studies.
8	Core Supp	Designation of the competencies and objectives as Core or Supplemental. Competencies and objectives designated Core must be included in the yearly calendar of work.

Activities and procedures within the Division of Vocational and Technical Education Services are governed by the philosophy of simple fairness to all. Therefore, the policy of the Division is that all operations will be performed without regard to race, sex, color, national origin or handicap.

HOME ECONOMICS EDUCATION
COURSE BLUEPRINT for 7075 (CIP#19 0502): FOOD SCIENCE
(Course length: 1 semester; Class Length: 1 period)

Comp# Obj #	Unit Titles / Competency and Objective Statements (The student will be able to:)	Time Hrs.	UNIT Weight	COURSE Weight	Type Behavior	Integrated Skill Area	Core Supp
1	2	3	4	5	6	7	8
		90		**100%**			
A	**INTRODUCTION TO FOOD SCIENCE**	**4**	**100%**	**6%**			
001.00	**Investigate the study of food science.**	**2**	**50%**	**2%**	**C3**	**CIMISC**	**Core**
001.01	*Explore the field of food science.*	*1*	*25%*	*1%*	*C3*	*CIMISC*	*Core*
001.02	*Explain the interrelationship between food science and other sciences.*	*1*	*25%*	*1%*	*C2*	*CIMISC*	*Core*
002.00	**Explore career opportunities in food science.**	**2**	**50%**	**4%**	**C3**	**C**	**Core**
002.01	*Identify entry-level and advanced-level careers in food science.*	*1*	*25%*	*2%*	*C1*	*C*	*Core*
002.02	*Examine education and training needed for a career in food science.*	*1*	*25%*	*2%*	*C3*	*C*	*Core*
B	**EVALUATION OF FOOD**	**14**	**100%**	**16%**			
003.00	**Apply scientific procedures in collecting, observing, recording, and analyzing data.**	**8**	**58%**	**9%**	*C3P*	**CIMISC**	**Core**
003.01	*Explain the steps in the scientific method.*	*2*	*15%*	*2%*	*C2*	*CIMISC*	*Core*
003.02	*Identify the basic units of the metric system of measurement.*	*2*	*15%*	*2%*	*C1*	*CIMISC*	*Core*
003.03	*Determine area, volume, weight, mass, and density.*	*1*	*7%*	*1%*	*C3*	*CIMISC*	*Core*
003.04	*Interpret symbols, formulas, and equations.*	*1*	*7%*	*2%*	*C2*	*CIMISC*	*Core*
003.05	*Write accurate and complete reports of food science experiments.*	*2*	*14%*	*2%*	*C3P*	*CIMISC*	*Core*
004.00	**Use scientific equipment.**	**3**	**21%**	**4%**	**C3P**	**CIHIMISC**	**Core**
004.01	*Identify scientific equipment used in the food science laboratory.*	*1*	*7%*	*1%*	*C1*	*CISC*	*Core*
004.02	*Demonstrate the proper use and care of scientific equipment.*	*1*	*7%*	*2%*	*C3P*	*CIHIMISC*	*Core*
004.03	*Describe safety guidelines in the laboratory.*	*1*	*7%*	*1%*	*C1*	*CIHISC*	*Core*
005.00	**Evaluate foods using the sensory process.**	**3**	**21%**	**3%**	**C3P**	**CISS**	**Core**
005.01	*Explore sensory evaluation.*	*2*	*14%*	*2%*	*C3P*	*CISS*	*Core*
005.02	*Determine factors that affect food preferences.*	*1*	*7%*	*1%*	*C3*	*CISS*	*Core*

1	2	3	4	5	6	7	8
C	**MATTER**	**6**	**100%**	**7%**			
006.00	**Demonstrate a working knowledge of basic science principles.**	**4**	**67%**	**4%**	**C3P**	**CIMISC**	**Core**
006.01	*Distinguish between elements, compounds, and mixtures.*	*2*	*33%*	*2%*	*C3*	*CISC*	*Core*
006.02	*Examine the structure of atoms and molecules.*	*1*	*17%*	*1%*	*C3P*	*CIMISC*	*Core*
006.03	*Explain the differences between ionic and covalent bonds and ionic and covalent compounds.*	*1*	*17%*	*1%*	*C3*	*CISC*	*Core*
007.00	**Investigate the relationship between matter and foods.**	**2**	**33%**	**3%**	**C3P**	**CISC**	**Core**
007.01	*Differentiate between chemical and physical changes in foods.*	*1*	*16%*	*1%*	*C3*	*CISC*	*Core*
007.02	*Demonstrate physical and chemical changes in food.*	*1*	*17%*	*2%*	*C3P*	*CISC*	*Core*
D	**ELECTROLYTE SOLUTIONS - ACIDS AND BASES**	**7**	**100%**	**7%**			
008.00	**Explore the role of acids and bases in foods.**	**4**	**57%**	**4%**	**C3P**	**CISC**	**Core**
008.01	*Explain how ionization relates to the formation of acids and bases.*	*1*	*14%*	*1%*	*C2*	*CISC*	*Core*
008.02	*Analyze the properties of acids and bases.*	*3*	*43%*	*3%*	*C3P*	*CISC*	*Core*
009.00	**Examine the pH scale and how it is used.**	**3**	**43%**	**3%**	**C3P**	**CISC**	**Core**
009.01	*Discuss the importance of pH in digestion.*	*1*	*14%*	*1%*	*C2*	*CISC*	*Core*
009.02	*Determine the pH of common foods.*	*2*	*29%*	*2%*	*C3P*	*CISC*	*Core*
E	**ENERGY**	**7**	**100%**	**7%**			
010.00	**Investigate how energy is released and absorbed through physical and chemical changes.**	**5**	**71%**	**5%**	**C3P**	**CISC**	**Core**
010.01	*Explore the relationship between energy, physical changes , and chemical reactions.*	*3*	*43%*	*3%*	*C3P*	*CISC*	*Core*
010.02	*Examine the relationship between molecular motion and temperature.*	*2*	*28%*	*2%*	*C3P*	*CISC*	*Core*
011.00	**Examine the relationship between food intake and body weight.**	**2**	**29%**	**2%**	**C3**	**CISC**	**Core**
011.01	*Discuss food components that the body uses for energy.*	*1*	*14%*	*1%*	*C2*	*CISC*	*Core*
011.02	*Determine factors that affect how the body uses energy.*	*1*	*15%*	*1%*	*C3*	*CISC*	*Core*
F	**FOOD CHEMISTRY**	**42**	**100%**	**47%**			
012.00	**Summarize the properties and uses of water.**	**7**	**17%**	**7%**	**C2**	**CISC**	**Core**
012.01	*Explain the properties of water.*	*4*	*9%*	*4%*	*C2*	*CISC*	*Core*
012.02	*Describe how hydrogen bonding differ from covalent bonds.*	*1*	*2%*	*1%*	*C1*	*CISC*	*Core*

1	2	3	4	5	6	7	8
012.03	*Explain heat of fusion and heat of vaporization.*	*2*	*6 %*	*2 %*	*C2*	*CISC*	*Core*
013.00	**Explain the importance of carbohydrates in foods.**	**6**	**14%**	**7%**	**C2**	**CISC**	**Core**
013.01	*Identify the chemical structure of simple and complex carbohydrates.*	*2*	*5 %*	*2 %*	*C1*	*CISC*	*Core*
013.02	*Explain the functions of sugar, starch, and pectin in food systems.*	*4*	*9%*	*5%*	*C2*	*CISC*	*Core*
014.00	**Explore the importance of lipids in foods.**	**7**	**17%**	**8 %**	**C3**	**CISC**	**Core**
014.01	*Compare the properties of saturated and unsaturated fatty acids.*	*2*	*5 %*	*3 %*	*C3*	*CISC*	*Core*
014.02	*Investigate the effects of fat in food preparation.*	*4*	*10%*	*4 %*	*C3*	*CISC*	*Core*
014.03	*Explain how oxidation can be controlled in foods.*	*1*	*2 %*	*1 %*	*C2*	*CISC*	*Core*
015.00	**Summarize the importance of protein in foods.**	**6**	**14%**	**7%**	*C2*	*CISC*	**Core**
015.01	*Identify the chemical structure of protein and amino acids.*	*1*	*2 %*	*1 %*	*C1*	*CISC*	*Core*
015.02	*Explain what causes denaturation.*	*2*	*5 %*	*2 %*	*C2*	*CISC*	*Core*
015.03	*Describe ways in which protein is used in food products.*	*3*	*7 %*	*4 %*	*C1*	*CISC*	*Core*
016.00	**Discuss the role of enzyme reactions in food products.**	**7**	**17%**	**8 %**	**C2**	**CISC**	**Core**
016.01	*Describe how enzymes act as catalysts in chemical reactions.*	*2*	*4 %*	*2 %*	*C1*	*CISC*	*Core*
016.02	*Identify factors that affect enzyme activity*	*3*	*8 %*	*3 %*	*C1*	*CISC*	*Core*
016.03	*Explain how enzyme reactions are involved in food production.*	*2*	*5 %*	*3 %*	*C2*	*CISC*	*Core*
017.00	**Analyze the functions of minerals and vitamins in the body.**	**5**	**12%**	**5 %**	**C3**	**CISC**	**Core**
017.01	*Discuss the interrelationship between vitamins and minerals in food preparation.*	*2*	*5 %*	*2 %*	*C2*	*CISC*	*Core*
017.02	*Explore the effects of heat, light, and pH on the stability of vitamins and minerals.*	*3*	*7%*	*3%*	*C3*	*CISC*	*Core*
018.00	**Evaluate the use of additives in foods.**	**4**	**9 %**	**5%**	**C3**	**CISC**	**Core**
018.01	*Explore the use of additives in foods.*	*3*	*7 %*	*4 %*	*C3*	*CISC*	*Core*
018.02	*Explain the role of governmental regulations regarding food additives.*	*1*	*2%*	*1%*	*C2*	*CISC*	*Core*

1	2	3	4	5	6	7	8
G	**LEADERSHIP AND CITIZENSHIP**	**10**	**100%**	**10%**			
019.00	**Work with others informally to accomplish group goals.**	**6**	**60%**	**6%**	**C3P**	**CISS**	**Core**
019.01	*Use information to determine group action.*	*2*	*20%*	*2%*	*C3P*	*CISS*	*Core*
019.02	*Use interpersonal communication skills to accomplish group goals.*	*2*	*20%*	*2%*	*C3P*	*CISS*	*Core*
019.03	*Manage resources to achieve group goals.*	*2*	*20%*	*2%*	*C3P*	*CISS*	*Core*
020.00	**Use parliamentary law to accomplish group goals.**	**4**	**40%**	**4%**	**C3P**	**CISS**	**Core**
020.01	*Examine organizational rules.*	*2*	*20%*	*2%*	*C3*	*CISS*	*Core*
020.02	*Demonstrate handling organizational business.*	*2*	*20%*	*2%*	*C3P*	*CISS*	*Core*

FOOD SCIENCE OUTLINE

Semester I

I. Introduction to Food Science
  A. Definition of food science
  B. Relationship of food science and other sciences
  C. Careers

II. A. Evaluation of Food
    1. Scientific method
    2. Measurements
    3. Computation
    4. Symbols, formulas, equations
    5. Interpreting data/results
  B. Objective Evaluation - Scientific Equipment
    1. Types of equipment
    2. Use and safety
    3. Care of equipment
  C. Subjective Evaluation - Sensory Evaluation
    1. Taste
    2. Touch
    3. Sight
    4. Hearing
    5. Smell

III. Matter
  A. Classification of Matter
    1. Atoms and molecules
    2. Elements, compounds, and mixtures
  B. Physical and chemical changes
  C. Chemical Bonding

IV. Electrolyte Solutions - Acids & Bases
  A. Ionization
  B. Properties of acids
  C. Properties of bases
  D. Acid-base equilibria and pH
  E. Concentrations

V. Energy
   - A. Forms of energy
   - B. Reaction rates
   - C. Energy effects

VI. Food Chemistry
   - A. Water
   - B. Carbohydrates
   - C. Lipids
   - D. Protein
   - E. Enzymes
   - F. Minerals and vitamins
   - G. Additives

VII. Leadership and Citizenship
   - A. Group goals
   - B. Communication
   - C. Resource management
   - D. Parliamentary procedures

Semester II

VIII. Food Mixtures
   - A. Solutions and dispersions
   - B. Gels, foams, and emulsions
   - C. Chemical leavening agents

IX. Food Microbiology
   - A. Types of microorganisms
   - B. Microbial Spoilage
   - C. Food safety
     - 1. Infections
     - 2. Intoxications
     - 3. Toxicoinfections
   - D. Sanitation
   - E. Fermentation

X. Food Preservation
   - A. Dehydration
   - B. Freezing
   - C. Canning
   - D. Irradiation
   - E. Packaging
   - F. Preservatives

XI. Complex Food Systems
   A. Components
   B. By-products

XII. Trends in Food Science
   A. Emerging Trends
      1. Careers
      2. Product development
      3. Consumer needs
   B. Research

COURSE:	Food Science	UNIT: **Introduction to Food Science**
COMPETENCY:	001.00 - C3	Investigate the study of food science.
OBJECTIVE:	001.01 - C3	*Explore the field of Food Science. (1)*

OUTLINE	BEHAVIOR	STRATEGIES
Study of Food Science Definition History Recent advancements Production Packaging Preparation Food technology	C3	Sample a breakfast item. List the chemicals in the food item. Review the transparency "Your Breakfast as Seen by a Chemist" and compare the lists. Recognize the importance of chemicals in foods.
	C2	Discuss the history of food science. Give examples of advancements in the production, packaging, and preparation of foods over the past 200 years.
	C1	Define food science. Discuss the advantages and disadvantages of our reliance on food technology. Explain what would happen if the study of food science ceased.
	C2	Illustrate the most recent developments in food science through a collage or bulletin board using newspapers, magazines, articles, etc. Discuss the importance of food science to consumers.

RESOURCES:

"Your Breakfast Chemicals"
Consumer Information

Food Science and You, pp.13-17

COURSE:	Food Science	UNIT: **Introduction to Food Science**
COMPETENCY:	001.00 - C3	Investigate the study of food science.
OBJECTIVE:	001.02 - C2	*Explain the interrelationship between food science and other sciences. (1)*

OUTLINE	BEHAVIOR	STRATEGIES
Interrelationship Between Food Science and Other Sciences	C1	Define the study of nutrition, biology, chemistry, physics, and microbiology.
Other Sciences: Nutrition Biology Chemistry Microbiology Physics	C2	Invite a food scientist, dietitian, chemist, biologist, and physicist to the classroom to discuss the role each field plays in the study of foods. Explain how the research done in one field affects the other fields of study.
	C2	Interpret the role of food science in the prevention and treatment of health problems. List various health problems that are being researched by food scientists. (Ex. cancer, heart disease, etc.) Identify alternative food choices for each health problem.[1]
	C2	Explain the similarities and differences between the RDA and U.S. RDA. Bring a food label to class and describe how to read the food label.[2]

(CONTINUED)

COURSE:	Food Science	UNIT: **Introduction to Food Science**
COMPETENCY:	001.00 - C3	Investigate the study of food science.
OBJECTIVE:	001.02 - C2	*Explain the interrelationship between food science and other sciences. (1)*

OUTLINE	BEHAVIOR	STRATEGIES
	C2	Knowing how to read food labels enables one to identify the ingredients and to recognize harmful additives and preservatives. Interpret you label reading IQ with "What's On A Label".[3]

RESOURCES:

[1] Display Kits for:
Alcohol, Sugar and Sweeteners
Fiber, Sodium, Fat
Penn State Nutrition Center

[2] "Interpreting Your Label
Reading Habits"
In SELF ASSESSMENT (1992)
Penn State Nutrition Center

[3] "What's On A Label"
In SELF ASSESSMENT (1992)
Penn State Nutrition Center

Food Science and You, pp.14-22
Teacher's Resource Guide, pp.19-35

"What's in the Food" (Filmstrip/Video)
Learning Seed

"Understanding Food Labels" (Video)
Learning Seed

COURSE:	Food Science	UNIT: **Introduction to Food Science**
COMPETENCY:	002.00 - C3	Explore career opportunities in food science.
OBJECTIVE:	002.01 - C1	*Identify entry-level and advanced-level careers in food science. (1)*

OUTLINE	BEHAVIOR	STRATEGIES
Careers Opportunities Food Science	C1	List the various branches of food science. Identify career areas open to people with college degrees in in food science and technology.
Career Levels Entry Advanced	C1	Give a description of the job related responsibilities of food scientists and food technologists.
	C1	Describe the participation of males and females in the areas of food science, food service industry, and biotechnology.
	C1	Describe the impact of technological advancements on career opportunities. List six careers that were not in existence 40 years ago.
	C1	Cite examples of food science careers after viewing the film, "Food: It's Science, Your Future".

RESOURCES:

Food Science and You, pp.364-373
Teacher's Resource Guide, pp.329-336

Introduction to Food Science and Technology

"Food: It's Science, Your Future"
"Food Science Careers", Free film loan from Modern Talking Picture Service

COURSE:	Food Science	UNIT: **Introduction to Food Science**
COMPETENCY:	002.00 - C3	Explore career opportunities in food science.
OBJECTIVE:	002.02 - C3	*Examine education and training needed for a career in food science. (1)*

OUTLINE	BEHAVIOR	STRATEGIES
Careers Opportunities **Education** **Training** **Personal Qualities** Careers Food scientist Food technologist	C3	Invite 3-4 persons to class who work in food science occupations. Ask them to tell the qualifications needed for careers in food science and the food service industry. Prepare questions prior to the guest speaker.
Sensory scientist Plant manager Director of quality control Director of research	C3	Research a food science related career. Identify the education, training, and personal qualities needed for that career.
Process engineer Equipment designer Consultant	C3	Determine the outlook for current food science careers.
Food microbiologist	C2	Summarize the career opportunities in your county and state.
	C1	Highlight the automated McDonald's in New York City. Discuss the effects of automation on food science and food service careers in the future.

RESOURCES:

Food Science and You, pp.364-373
Teacher's Resource Guide, 329-336

Introduction to Food Science and Technology

COURSE:	Food Science	UNIT: **Evaluation of Food**
COMPETENCY:	003.00 - C3P	Apply scientific procedures in collecting, observing, recording, and analyzing data.
OBJECTIVE:	003.01 - C2	*Explain the steps in the scientific method. (2)*

OUTLINE	BEHAVIOR	STRATEGIES
Evaluation of Food Scientific Method State the problem Gather information Form a hypothesis Collect data Record/analyze data Report results	C1	Define the following terms: Scientific method Theory Hypothesis Data Inductive reasoning Deductive reasoning Dependent variable Independent variable
	C2	Summarize each step of the scientific method in sequence. Relate the steps to a recent problem you have encountered.
	C2	Discuss the importance of the scientific process to problem solving.
	C2	Give examples of researchable hypotheses for food science experiments.
	C1	Identify resources that can be used to gather information for a research problem.

(CONTINUED)

COURSE: Food Science — UNIT: **Evaluation of Food**

COMPETENCY: 003.00 - C3P — Apply scientific procedures in collecting, observing, recording, and analyzing data.

OBJECTIVE: 003.01 - C2 — *Explain the steps in the scientific method. (2)*

OUTLINE	BEHAVIOR	STRATEGIES
	C2	Explain the process of observation, analysis, and interpretation of data. Make general statements about the effects of errors in observation and/or analysis of data would have on the interpretation of the data. Explain how reliable or unreliable the results would be.
	C1	Cite a food related example of a situation in which error in observation and data analysis could have harmful results.
	C2	Interpret the data from an experiment and write up the report.
	C1	The steps given in the scientific method are the usual procedures in conducting research. The sequence may be altered in some experiments, however all of the steps should be present. Identify the steps of the scientific method from a completed food science experiment.

(CONTINUED)

COURSE:	Food Science	UNIT: **Evaluation of Food**
COMPETENCY:	003.00 - C3P	Apply scientific procedures in collecting, observing, recording, and analyzing data.
OBJECTIVE:	003.01 - C2	*Explain the steps in the scientific method. (2)*

OUTLINE	BEHAVIOR	STRATEGIES

RESOURCES:

Food Science and You, pp.29-30, 353-359.
Teacher's Resource Guide, pp. 28-29

Earth Science, pp.6-13

COURSE:	Food Science	UNIT: **Evaluation of Food**
COMPETENCY:	003.00 - C3P	Apply scientific procedures in collecting, observing, recording, and analyzing data.
OBJECTIVE:	003.02 - C1	*Identify the basic units of the metric system of measurement. (2)*

OUTLINE	BEHAVIOR	STRATEGIES
Basic Units of Metric System	C1	Recognize the units of the metric system by length, mass (weight), and volume.
Length		
Kilometer Meter Centimeter Millimeter	C1	Match the metric value of a measurement with the English value of the measurement.
Mass Kilogram Gram Centigram Milligram Volume Liter Milliliter Cubic centimeter Temperature Celsius	C1	State the meaning of the metric prefixes below: mega- kilo- hecto- deka- deci- centi- milli- . Remember all prefixes mean the same no matter what you are measuring.
	C1	Label thermometers used to measure fahrenheit and celsius temperature scales.

(CONTINUED)

COURSE:	Food Science	UNIT: **Evaluation of Food**
COMPETENCY:	003.00 - C3P	Apply scientific procedures in collecting, observing, recording, and analyzing data.
OBJECTIVE:	003.02 - C1	*Identify the basic units of the metric system of measurement. (2)*

OUTLINE	BEHAVIOR	STRATEGIES
	C1	Tell the advantages of using the metric system in food science experiments.
	C1	Tell how to read the celsius temperature scale.
	C1	Write directions for changing Celsius degrees to Fahrenheit degrees.

RESOURCES:

Food Science and You, p.25
Teacher's Resource Guide, 19-35

"Metrics Made Easy", Filmstrip
Franklin Clay Films

Contemporary Chemistry

COURSE:	Food Science	UNIT: **Evaluation of Food**
COMPETENCY:	003.00 - C3P	Apply scientific procedures in collecting, observing, recording, and analyzing data.
OBJECTIVE:	003.03 - C3	*Determine the area, volume, weight, mass, and density. (1)*

OUTLINE	BEHAVIOR	STRATEGIES
Applying the Metric System	C3	Distinguish between area, volume, weight, mass, and density.
Calculate: Area Volume Weight Density	C1	Recognize the scientific equipment used, in the laboratory, for measuring area, volume, weight, mass and density.
Determine: Mass	C3	Calculate the area or volume of a block or rectangular solid. Compare your answers with other students.
	C3	Find the weight of a flask filled with water.
	C3	Calculate the density of an object.
	C3	Complete experiment I-B to determine whether measuring by volume or by mass gives more precise results.[1]
	C2	Discuss appropriate units of measurements for different food items pictures or products.

(CONTINUED)

COURSE:	Food Science	UNIT: **Evaluation of Food**
COMPETENCY:	003.00 - C3P	Apply scientific procedures in collecting, observing, recording, and analyzing data.
OBJECTIVE:	003.03 - C3	*Determine the area, volume, weight, mass, and density. (1)*

OUTLINE	BEHAVIOR	STRATEGIES
	C3	Calculate the number of servings from the label of various food items, using the metric system.
	C3	Demonstrate the concept of density using different solvents. Observe the effect of temperature on the density of water.[2]

RESOURCES:

Food Science and You, p.17
Teacher Resource Guide, p.19-35

Chemistry: A Modern Course

[2]Nutrition Science Lab: Body
Composition-Density Demonstration
Lab Experiments/Pen-Pencil Activities
Penn State Nutrition Center

[1]Science in the Marketplace, pp.1-35
Korchin, Florence G. (1983)

Introduction to Physical Science

COURSE:	Food Science	UNIT: **Evaluation of Food**
COMPETENCY:	003.00 - C3P	Apply scientific procedures in collecting, observing, recording, and analyzing data.
OBJECTIVE:	003.04 - C2	*Interpret symbols, formulas, and equations. (1)*

OUTLINE	BEHAVIOR	STRATEGIES
Chemical Information	C1	Recognize the basic chemical elements and symbols on a periodic table.
Symbols Formulas Equations	C1	Match the elements with the correct chemical symbols.
	C1	Identify sample food items that contain at least one of the chemical elements.
	C2	Explain how compounds are formed.
	C2	Explain the use of symbols, formulas, and subscripts in CO_2.
	C2	Explain the difference in coefficients and subscripts.
	C2	Interpret the chemical equations for the following items and identify a common occupational use of each: — sugar — sodium hydroxide — sodium chloride

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RESOURCES:

Food Science and You, pp.53-56, 375

"Basic Chemistry", Filmstrip/Video
American School Publishers

COURSE:	Food Science	UNIT: **Evaluation of Food**
COMPETENCY:	003.00 - C3P	Apply scientific procedures in collecting, observing, recording, and analyzing data.
OBJECTIVE:	003.05 - C3P	*Write accurate and complete reports of food science experiments. (2)*

OUTLINE	BEHAVIOR	STRATEGIES
Laboratory Reports Preparation Title of experiment Researcher(s)	C2	Explain the necessary components of of all laboratory reports. Discuss the importance of each component: preparation and results.
Purpose Procedure Results Observations Data/tables/graphs Calculations Questions Conclusion	C3	Critically analyze a written report of a food science experiment. Determine if the report covers all aspects of the hypothesis. Consider the extent to which the written description adequately describes the preparation and results component.
	C3P	Having observed a laboratory experiment. Write an accurate and complete laboratory report of the experiment using the Food Science Laboratory Report Form. [1] Share your results with the class.
	C3P	Review samples of completed laboratory reports. Compare and contrast the purpose, hypothesis, and procedure on each report. Rank the reports according to clarity and conciseness.

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COURSE:	Food Science	UNIT: **Evaluation of Food**
COMPETENCY:	003.00 - C3P	Apply scientific procedures in collecting, observing, recording, and analyzing data.
OBJECTIVE:	003.05 - C3P	*Write accurate and complete reports of food science experiments. (2)*

OUTLINE	BEHAVIOR	STRATEGIES
	C3P	Practice translating data tables to graphs. Then prepare a written explanation of the graph. Compare your written explanation with another student.
	C3	After analyzing a food science experiment write an accurate and complete report that address the steps of the scientific method. Label each step.

RESOURCES:

Food Science and You, pp.29-30
Teacher's Resource Guide, pp.28-29

COURSE:	Food Science	UNIT: **Evaluation of Food**
COMPETENCY:	004.00 - C3P	Use scientific equipment.
OBJECTIVE:	004.01 - C1	*Identify scientific equipment used in the food science laboratory. (1)*

OUTLINE	BEHAVIOR	STRATEGIES
Basic Scientific Food Equipment in Food Science Experiments	C1	Label the pieces of scientific equipment on a display or exhibit.
Containers Beaker	C1	State the purpose of each piece of scientific equipment.
Graduated cylinder Erlenmeyer flask Buret Petri dish	C1	Write directions for using the basic equipment used in food science experiments.
Test tube Thermometers Balance Standard	C1	Identify scientific equipment used for measuring. Recognize the equipment that requires calibration.
Electronic Support items Rings	C1	Cite examples of how various pieces of equipment are used together.
Stands Clamps	C1	Identify equipment that give precise measurement and those that do not.
	C1	Describe the appropriate equipment to measure the following items: - the mass of a bag of potato chips - the volume of a drink - the area of a slice of cheese

RESOURCES:

Food Science and You, pp.22-26
Teacher's Resource Guide, pp.25-26

COURSE:	Food Science	UNIT: **Evaluation of Food**
COMPETENCY:	004.00 - C3P	Use scientific equipment.
OBJECTIVE:	004.02 - C3P	*Demonstrate the proper use and care of scientific equipment. (1)*

OUTLINE	BEHAVIOR	STRATEGIES
Scientific Equipment Use Calibration Reading measurements	C3P	Demonstrate the proper techniques for using graduated cylinders. Conduct Experiment 1-2: Using a Graduated Cylinder, Food Science and You, p.32.
Care Storage Sanitation Handling	C3P	Conduct Experiment 1-1: Using an Electronic Balance, Food Science and You, p.31. Also conduct Experiment 1-A: Using a Triple Beam Balance, Teacher's Resource Guide, p. 30.
	C3P	Demonstrate how to calibrate measuring equipment. Discuss the importance of measuring precision in the observation, analysis and interpretation of data.
	C3P	Model precision in measuring length, temperature, and volume.
	C3P	Demonstrate the proper procedure for the cleaning, storage, and transportation of equipment.

RESOURCES:

Food Science and You, p.31-32
Teacher's Resource Guide, p.19-35

COURSE:	Food Science	UNIT: **Evaluation of Food**
COMPETENCY:	004.00 - C3P	Use scientific equipment.
OBJECTIVE:	004.03 - C1	*Describe safety guidelines in the laboratory. (1)*

OUTLINE	BEHAVIOR	STRATEGIES
Laboratory Safety	C1	Discuss safety procedures for the food science laboratory.
Before the Experiment Pre-planning Proper dress Protective gear Sanitation	C1	Specify how to protect clothing, skin, and eyes from harmful chemicals and burns.
During the Experiment Organization Caution Cleanliness	C1	Identify equipment used to transport or handle hot substances and containers.
After the experiment Sanitation Transportation and storage of equipment	C1	Describe the proper procedures for handling broken glass.
	C1	Specify the proper procedures for for emergency situations (Ex. chemicals in eyes or on skin, cuts, burns).
	C1	Describe the appropriate dress for laboratory experiments.
	C1	Specify appropriate behavior when using heating elements and flammable chemicals.

RESOURCES:

Food Science and You, pp.27-29	"Lab Safety", Filmstrip
Teacher's Resource Guide, p.24	American School Publishers

COURSE: Food Science UNIT: **Evaluation of Food**

COMPETENCY: 005.00 - C3P Evaluate foods using the sensory process.

OBJECTIVE: 005.01 - C3P *Explore sensory evaluation. (2)*

OUTLINE	BEHAVIOR	STRATEGIES
Evaluating Foods Sensory Process Sight Taste	C1	Many senses are used to identify a product. Define sensory evaluation. List the qualities that make-up sensory characteristics of foods.
Temperature Taste buds Touch	C3	Contrast object and subject food evaluation techniques.
Mouth feel Texture Hearing	C2	Explain what consumer evaluation panels do and how they function.
	C3P	Conduct Laboratory Experiment 2-1: Odor Recognition, Food Science and You, p.45. Discover how difficult it is to identify common foods by odor alone.
	C3	The senses are interdependent in regard to food evaluation. Explain what would happen if one loss the use of one of the five senses.
	C2	Identify 3 careers in the area of sensory evaluation. Describe the qualifications and responsibilities of food sensory evaluators.

(CONTINUED)

COURSE: Food Science UNIT: **Evaluation of Food**

COMPETENCY: 005.00 - C3P Evaluate foods using the sensory process.

OBJECTIVE: 005.01 - C3P *Explore sensory evaluation. (2)*

OUTLINE	BEHAVIOR	STRATEGIES
	C3P	Conduct Experiment 2-2: Flavor Comparison, Food Science and You to determine the degree of sweetness, sourness, and saltiness of various solutions.
	C3P	Research the term "Tongue Mapping." List the four types of taste buds and describe the location of each.
	C3P	Plan and conduct a sensory evaluation of one popular food item (ex. 3 different brands of vanilla ice cream, cookies, soft drinks, etc.). Use the steps in the scientific method to carry out the process. Write up the results using the standard laboratory report form. Develop a graph of the data. Present your findings at the next FHA meeting.

RESOURCES:

Food Science and You, p.34-43, 45-47
Teacher's Resource Guide,p.28, 36-51

COURSE:	Food Science	UNIT: **Evaluation of Food**
COMPETENCY:	005.00 - C3P	Evaluate foods using the sensory process.
OBJECTIVE:	005.02 - C3	*Determine factors that affect food preferences. (1)*

OUTLINE	BEHAVIOR	STRATEGIES
Food Preferences Cultural Other Influences Environmental Individual preferences	C3	Interview members of your family to identify 10 foods that are apart of your cultural heritage. Place an X beside those food that remain popular with your generation.
	C2	Explain how family and cultural food traditions have affected your food preferences. Make a list of other factors that have influenced your food preferences.
	C1	Food preferences are often affected by the appeal to one of the five senses. Identify commercials that market food items by appealing to one or more senses.
	C3	Identify your least and most favorite food. Try to determine the factors that affect your likes and dislikes (ex. psychological, cultural, biological, etc.). Create a bulletin board illustrating factors that affect food preferences.

RESOURCES:

Food Science and You, pp.43, 45-47
Teacher's Resource Guide, pp.36-51

COURSE:	Food Science	UNIT: **Matter**
COMPETENCY:	006.00 - C3P	Demonstrate a working knowledge of basic science principles.
OBJECTIVE:	006.01 - C3	*Distinguish between elements, compounds, and mixtures. (2)*

OUTLINE	BEHAVIOR	STRATEGIES
Matter Pure Substances Elements Compounds Mixtures Heterogeneous Homogeneous	C1	Define matter. Cite 10 examples of matter found in the classroom. Cite food examples of matter.
	C1	Define the term properties. Describe the properties of various food items.
	C3	Distinguish between the 2 major categories of matter. Describe the 4 major sub-categories of matter and cite 4 examples of each.
	C2	Explain the relationship of a molecule to elements and compounds.
	C1	List the 12 elements in the human body: Carbon, Hydrogen, Oxygen, Phosphorus, Potassium, Iodine, Nitrogen, Sulfur, Calcium, Iron, Sodium, Chlorine.

RESOURCES:

Food Science and You, pp.48-51
Teacher's Resource Guide, pp.52-65

Introduction to Physical Science

Chemistry: A Modern Course

"Basic Chemistry", Filmstrip/Video
American School Publishers

COURSE: Food Science UNIT: **Matter**

COMPETENCY: 006.00 - C3 Demonstrate a working knowledge of basic science principles.

OBJECTIVE: 006.02 - C3P *Examine the structure of atoms and molecules. (1)*

OUTLINE	BEHAVIOR	STRATEGIES
Atoms Subatomic Particles Protons Neutrons Electrons Nucleus	C1	Define the following terms: Atom Nucleus Protons Neutrons Electrons
	C2	Summarize the properties of subatomic particles (protons, neutrons, electrons).
	C2	Explain the relationship between atoms, molecules, elements, and compounds.
	C3P	Use various objects (grapes, styrofoam, balls, clay, marbles, etc.) to construct a graphic representation of an atom.
	C3P	Investigate various models of molecules. Construct a model of a molecule associated with food or digestion. State the formula and purpose for each molecule.

RESOURCES:

Food Science and You, pp.52-56
Teacher's Resource Guide, pp.52-65

Chemistry: A Modern Course

COURSE:	Food Science	UNIT: **Matter**
COMPETENCY:	006.00 - C3P	Demonstrate a working knowledge of basic science principles.
OBJECTIVE:	006.03 - C3	*Explain the differences between ionic and covalent bonds and ionic and covalent compounds. (1)*

OUTLINE	BEHAVIOR	STRATEGIES
Chemical Bonding	C1	Describe the role of chemical bonds on molecules.
Ionic Bonding Electron transfer Ions Ionic bonds	C2	After defining the term ion, explain how ionic bonds are formed.
Ionic compound Metals Non-metals Covalent Bonding Covalent bond	C3	Develop a list of 5 ionic compounds or Salts associated with foods. State the formula and the food item for each compound.
Covalent compound Covalent molecules	C2	Explain how covalent bonds are formed. Tell what takes place in forming ionic bonds that does not take place in forming covalent bonds.
	C1	Cite examples of covalent compounds associated with foods.
	C3	Review the diagrams on pp.57-58 of Food Science and You. Compare the similarities and differences in ionic and covalent bonding.

RESOURCES:

Food Science and You, pp.56-58
Teacher's Resource Guide, 52-65

Chemistry: A Modern Course

COURSE:	Food Science	UNIT: **Matter**
COMPETENCY:	007.00 - C3P	Investigate the relationship between matter and foods.
OBJECTIVE:	007.01 - C3	*Differentiate between chemical and physical changes in foods. (1)*

OUTLINE	BEHAVIOR	STRATEGIES
Chemical and Physical Changes Chemical and Physical Phase change Solid Liquid Gas	C1	A chemical change in food item results in a new substance formed with different characteristics. Cite 5 examples of food items that resulted from such a chemical change.
	C2	Explain the meaning of physical change in food items. Cite 5 examples of foods that changed physically but not the chemical nature of matter.
	C1	Define chemical and physical properties.
	C3	Determine if the following are examples of physical or chemical properties: Boiling points Freezing points Odor Density Color Flammability Corrosion
	C2	Describe the effects of physical and chemical changes on the nutritive value of foods.

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COURSE:	Food Science	UNIT: **Matter**
COMPETENCY:	007.00 - C3P	Investigate the relationship between matter and foods.
OBJECTIVE:	007.01 - C3	*Differentiate between chemical and physical changes in foods. (1)*

OUTLINE	BEHAVIOR	STRATEGIES
	C3	Determine if the following food items are a result of a physical or chemical change: Ice melting or evaporating Peeling an apple Apple turning brown Egg cooking Carmelization Making jelly Toast Sugar cube in water Tea

RESOURCES:

Food Science and You, pp.58-61
Teacher's Resource Guide, pp.52-65

Chemistry: A Modern Course

Introduction to Physical Science

COURSE: Food Science UNIT: **Matter**

COMPETENCY: 007.00 - C3P Investigate the relationship between matter and foods.

OBJECTIVE: 007.02 - C3P *Demonstrate physical and chemical changes in foods. (1)*

OUTLINE	BEHAVIOR	STRATEGIES
Physical and Chemical Changes Mass and Volume Changes due to	C3P	Conduct Experiment 3-1: Mass and Volume of Beans, Food Science and You, to determine the changes in volume due to water absorption.
Water absorption Water displacement Dissolving substances	C3P	Conduct Experiment 3-2: Physical and Chemical Changes, Food Science and You to examine types of changes in a related food item.

RESOURCES:

Food Science and You, pp.62-65
Teacher's Resource Guide, pp.52-65

Introduction to Physical Science

Chemistry: A Modern Course

COURSE:	Food Science	UNIT: **Acids and Bases**
COMPETENCY:	008.00 - C3P	Explore the role of acids and bases in foods.
OBJECTIVE:	008.01 - C2	*Explain how ionization relates to the formation of acids and bases. (1)*

OUTLINE	BEHAVIOR	STRATEGIES
Acids and Bases	C1	Define the terms on p.80, Food Science and You, 'Terms to Remember.'
Ionization of Water Hydrogen ions Hydroxide ions Neutral	C2	Discuss what happens when water ionizes.
	C2	Illustrate ionization through the use of a molecular model. Write the equation that represents the ionization of water.

RESOURCES:

Food Science and You, pp.80-81
Teacher's Resource Guide, pp.80-95

Experiments in Food Science

Chemistry: A Modern Course

Principles of Biochemistry

COURSE:	Food Science	UNIT: **Acids and Bases**
COMPETENCY:	008.00 - C3P	Explore the role of acids and bases in foods.
OBJECTIVE:	008.02 - C3P	*Analyze the properties of acids and bases. (3)*

OUTLINE	BEHAVIOR	STRATEGIES
Acids and Bases Properties of Acids Properties of Bases	C2	After viewing the film, "Chemistry: Acids, Bases, and Salts," identify the properties of acids and bases.
	C3P	Conduct Experiment 5-A: Using Red Cabbage to Identify Acids and Bases, Teacher's Resource Guide, pp.83,92.
	C3P	Color indicators can be used to monitor changes in the pH of a system. Read, 'Nutrition Science Lab: Acid-Base Indicators in Food' (Penn State Nutrition Center). Conduct the pH experiment to determine the change in color that occurs when acid or base is added to a variety of fruits and vegetables. Compare your results with your classmates.
	C3P	Observe a demonstration of baking an Angel Food Cake. Explain why the cake remains white.

RESOURCES:

Food Science and You,p.80-82
Teacher's Resource Guide, pp.80-95

"Chemistry: Acids, Bases, & Salts"
CORO, 1983, (Film)

Experiment: Acid-Base Indicators in Foods, Lab Experiments/Pen-Pencil Activities, Penn State Nutrition Center

"Special Topics in Chemistry"
(Filmstrip/Video)
American School Publishers

COURSE:	Food Science	UNIT: **Acids and Bases**
COMPETENCY:	009.00 - C3P	Examine the pH scale and how it is used.
OBJECTIVE:	009.01 - C2	*Discuss the importance of pH in digestion. (1)*

OUTLINE	BEHAVIOR	STRATEGIES
pH in Digestion	C1	Identify devices used for measuring pH.
Measuring pH		
Indicator paper	C2	Interpret the values of the pH scale.
pH meter		
Titration	C2	Explain the relationship between pH of blood and health. Tell what happens if a person develops acidosis or alkalosis.
pH values		
Blood pH		
Acidosis		
Alkalosis		
Food and pH	C2	Summarize the relationship between pH, health, and digestion. Discuss the importance of pH to digesting various types of foods.
Digestion		
Nutrition		
	C2	Discuss the affect of different pH levels on food safety,
	C1	Identify the pH at which bacteria, yeast and mold grow.

RESOURCES:

Food Science and You, pp.88-89
Teacher's Resource Guide, pp.80-95

Experiments in Food Science

COURSE:	Food Science	UNIT: **Acids and Bases**
COMPETENCY:	009.00 - C3P	Examine the pH scale and how it is used.
OBJECTIVE:	009.02 - C3P	*Determine the pH of common foods.(2)*

OUTLINE	BEHAVIOR	STRATEGIES
pH in Foods Changes in Foods Color Taste Temperature	C3P	Conduct Experiment 5-1: The pH of Common Foods, Food Science and You, p.92-93, to determine the pH of foods and food ingredients that are commonly eaten.
Neutralization	C3P	Compare the acetic acid content of several brands of vinegar by conducting Experiment 5-2: Neutralization, Food Science and You, p.94.
	C2	Explain the role of pH in food processing and preservatives. Describe the level of pH necessary to ensure that canned food is safe from C. *botulinum*.
	C3P	Observe the changes in pH as the carbonation levels of solutions vary.

RESOURCES:

Food Science and You, pp.83-85, 89-95
Teacher's Resource Guide, pp.80-95

Principles of Biochemistry

Chemistry: A Modern Course

COURSE:	Food Science	UNIT: **Energy**
COMPETENCY:	010.00 - C3P	Investigate how energy is released and absorbed through physical and chemical changes.
OBJECTIVE:	010.01 - C3P	*Describe the relationship between energy, physical changes, and chemical reactions. (3)*

OUTLINE	BEHAVIOR	STRATEGIES
Energy Properties of Matter Heat and Phase Changes Factors Affecting Rates of Reaction	C2	Define energy and discuss how temperature and surface area affect the physical and chemical changes in food substances in three stages: solids, liquids, and gases.
Temperature Surface temperature	C3P	Use illustrations to show particles of matter in three states: solids, liquids, and gases.
	C3P	Compare the effect of various temperatures on rates of reaction. Conduct Experiment 4-1: Effect of Temperature on Cooking Rate, Food Science and You, p.77.
	C3P	Conduct Experiment 4-2: Effect of Surface Area on Cooking Rate, Food Science and You, p.78.

RESOURCES:

Food Science and You, pp.66-79
Teacher's Resource Guide, pp.66-79

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COURSE:	Food Science	UNIT: **Energy**
COMPETENCY:	010.00 - C3P	Investigate how energy is released and absorbed through physical and chemical changes.
OBJECTIVE:	010.01 - C3P	*Explore the relationship between energy, physical changes, and chemical reactions. (3)*

OUTLINE	BEHAVIOR	STRATEGIES
Metabolism	C1	Define anabolism and catabolism.
Process of Metabolism Anabolism Catabolism	C2	Explain how anabolism and catabolism differs from metabolism.
Regulation of Chemicals Osmosis Digestion	C1	Describe conditions needed for metabolism to occur.
	C2	Discuss metabolism as it relates to the digestive system.
	C3P	Conduct Laboratory Experiment 11-1: Osmosis - Travel Through a Membrane, Food Science and You, pp.188-189. Observe the process of osmosis by noting changes in the level of liquid surrounding raw shelled eggs and changes in appearance of the eggs themselves.

RESOURCES:

Food Science and You, pp.66-72,77-79, 77-79, 176-180
Teacher's Resource Guide, 66-70,166-179

Nutrition Science Lab: Osmosis/Diffusion
Lab Experiments/Pen-Paper Activities
Penn State Nutrition Center

Food Science

COURSE:	Food Science	UNIT: **Energy**
COMPETENCY:	010.00 - C3P	Investigate how energy is released and absorbed through physical and chemical changes.
OBJECTIVE:	010.02 - C3P	*Examine the relationship between molecular motion and temperature. (2)*

OUTLINE	BEHAVIOR	STRATEGIES
Molecular Motion Molecular Motion Absolute zero Specific heat Heat Transfer Conduction Convection Radiation	C2	After viewing the film, "Molecular Motion" (13 minutes) discuss the difference between heat and temperature. Discuss the three methods of heat transfer: conduction convection, radiation.
	C3P	Discuss how different substances transfer heat at different rates. Conduct Experiment 4-A: Heat Transfer Through Metal, Food Science and You Teacher's Resource Guide, p.68.
	C3P	Prepare a typical custard to show heat transfer by conduction and convection.

RESOURCES:

Food Science and You, pp.66-79
Teacher's Resource Guide, pp.66-79

Food Science

"Molecular Motion", (Film)
Modern Learning Aid (MOLA)
c/o Ward Natural Science

COURSE:	Food Science	UNIT: **Energy**
COMPETENCY:	011.00 - C3	Examine the relationship between food intake and body weight.
OBJECTIVE:	011.01 - C2	*Discuss food components that the body uses for energy. (1)*

OUTLINE	BEHAVIOR	STRATEGIES
Kilocalories Kilocalories and You Kilocalories in food Energy Calorimetry	C1	Define the following terms: Calories Kilocalories Calorie intake Calorie output Unit of measure. Read and discuss p.73-76 Food Science and You.
	C1	Identify food sources that provide energy for the body: fat, protein, carbohydrates.
	C2	Explain the relationship between food intake and body weight.
	C2	Explain the process by which food is converted into energy after conducting Laboratory Experiment 11-2: Kilocalories in Food, Food Science and You, pp.190-191.

RESOURCES:

Food Science and You, pp.73-76
Teacher's Resource Guide, pp.66-79, 166-179

Nutrition Science Lab: Bomb Calorimetry, Lab Experiments/Pen-Pencil Activities, Penn State Nutrition Center

"Weightcalc", Software
Learning Seed

COURSE:	Food Science	UNIT: **Energy**
COMPETENCY:	011.00 - C3	Examine the relationship between food intake and body weight.
OBJECTIVE:	011.02 - C3	*Determine factors that affect how the body uses energy. (1)*

OUTLINE	BEHAVIOR	STRATEGIES
Energy Balance Calorie intake Calorie output Use of Calories	C2	Discuss the importance of balancing energy intake and expenditures in order to maintain/lose/gain weight.
Digestion Basic functions Physical activity Basal Metabolism Calculating BMR Fasting	C2	Read "Energy Balance and "The Survival Mission". Define basal metabolic rate. Explain how basal metabolic rate affects how the body uses energy.
	C1	Illustrate whether you are in energy balance by calculating your caloric intake and caloric expenditure.
	C1	Describe metabolic changes that can occur during fasting and their effects on the body.
	C3	Construct a simple calorimeter and demonstrate that foods contain energy that is released when they are burned.

RESOURCES:

Food Science and You, pp.76-79
Teacher's Resource Guide, pp.66-79, 166-179

"Energy Balance" and "The Survival Mission"
Lab Experiments/Pen-Pencil Activities
Penn State Nutrition Center

COURSE:	Food Science	UNIT: **Food Chemistry**
COMPETENCY:	012.00 - C2	Summarize the properties and uses of water.
OBJECTIVE:	012.01 - C2	*Explain the properties of water. (4)*

OUTLINE

Properties of Water

- Structure of Water
  - Polar molecule
  - Hydrogen bonds
- Component of Food and Nutrition
  - Food preparation
  - Functions of water in the body
- Water Quality
  - Types of water
    - Hard
    - Soft
    - Distilled
    - Ionized
- Water Purification

BEHAVIOR	STRATEGIES
C1	Identify the four properties of water: Surface tension Heat capacity Capillarity Dissolving ability
C2	Illustrate the structure of a water molecule.
C2	Illustrate the structural design of a hydrogen bond.
C2	Following the Laboratory Experiment 6-2: Dissolving solids in Water, Food Science and You, p.109, explain the effect of water temperature on the solubility of various substances.
C1	Identify 4 facts about water. Describe the functions of water in the body. Explain how the body obtains water.[1]
C1	Identify the properties of water which influence food preparation techniques. Describe the role of water in food preparation.

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COURSE: Food Science — UNIT: **Food Chemistry**

COMPETENCY: 012.00 - C2 — Summarize the properties and uses uses of water.

OBJECTIVE: 012.01 - C2 — *Explain the properties of water. (4)*

OUTLINE	BEHAVIOR	STRATEGIES
	C2	Identify properties of "hard" and "soft" water. Discuss the difference(s) between different qualities of water.
	C2	Discuss the use of distilled and ionized water in food science.
	C2	Explain the relationship between metal ions and "hard" and "soft" water.
	C2	Draw together samples of water from various locations in the school and community. Use the samples to conduct experiments in water purification. Conduct Lab. Experiment 6-A: Purifying Water, Teacher's Resource Guide, p.98.[1]
	C2	Listen to a guest speaker discuss water treatment processes and related careers.

RESOURCES:

Food Science and You, pp.97-111
Teacher's Resource Guide, p.96-110

Modern Biology, pp.47-48

[1] "Maintaining Fluid Balance",
Adolescent Nutrition Resource Packet
Penn State Nutrition Center

COURSE:	Food Science	UNIT: **Food Chemistry**
COMPETENCY:	012.00 - C2	Summarize the properties and uses of water.
OBJECTIVE:	012.02 - C1	*Describe how hydrogen bonding differs from covalent bonds. (1)*

OUTLINE	BEHAVIOR	STRATEGIES
Properties of Water	C1	Describe the difference between hydrogen and covalent bonds.
Hydrogen Bonds Covalent Bonds	C1	Tell why pipes burst when frozen.
	C2	Choose various objects and develop visual models of covalent and hydrogen bonds (i.e. gumdrops, toothpicks, play dough, drinking straws).
	C1	Write a descriptive paragraph describing hydrogen bonds and how they differ from covalent bonds.

RESOURCES:

Food Science and You, pp.97-111
Teacher's Resource Guide, pp.96-110

COURSE:	Food Science	UNIT: **Food Chemistry**
COMPETENCY:	012.00 - C2	Summarize the properties and uses of water.
OBJECTIVE:	012.03 - C2	*Explain heat of fusion and heat of vaporization. (2)*

OUTLINE	BEHAVIOR	STRATEGIES
Phase Changes	C1	Define sublimation.
Phase Changes in $H_2$0 Melting point Boiling point Sublimation	C1	Tell the temperature when water begins to freeze and when it becomes completely solid.
	C1	Identify the temperature when water is most dense.
	C2	Summarize the phase changes that occur when freezing a cup 2/3 full of water and when changing from liquid water to vapor.
	C2	Explain the effect of phase changes on food (i.e. freezer burn).
	C2	Summarize the effects of temperature and amount of liquid on boiling points as presented in Laboratory Experiment 6-1: The Boiling Point of Water, Food Science and You, p.108.
	C2	Summarize the effects of temperature and amount of liquid on melting points.

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COURSE:	Food Science	UNIT: **Food Chemistry**
COMPETENCY:	012.00 - C2	Summarize the properties and uses of water.
OBJECTIVE:	012.03 - C2	*Explain heat of fusion and heat of vaporization. (2)*

OUTLINE	BEHAVIOR	STRATEGIES
	C2	Discuss reasons for using rock salt in making ice cream. Explain the effect of rock salt on heat of fusion. Conduct Laboratory Experiment 13-A: Salt and Homemade Ice Cream, Teacher's Resource Guide, p.196.
	C2	Summarize the process of extraction and sublimation after conducting the Nutrition Science Lab: Isolation of Caffeine from Beverages.

RESOURCES:

Food Science and You, pp.98-111
Teacher's Resource Guide, pp.96-110

Nutrition Science Lab: Isolation
of Caffeine from Beverages
Lab Experiments/Pen-Pencil Activities
Penn State Nutrition Center

COURSE:	Food Science	UNIT: **Food Chemistry**
COMPETENCY:	013.00 - C2	Explain the importance of carbohydrates in foods.
OBJECTIVE:	013.01 - C1	*Identify the chemical structure of simple and complex carbohydrates. (2)*

OUTLINE	BEHAVIOR	STRATEGIES

Production of Carbohydrates
 	
Sources of Energy
Chemical Structure
  Simple
  Complex
Plants as Producers
  Photosynthesis
  Chlorophyll
  Glucose
	C1	Define the following terms:
		Carbohydrates
		Photosynthesis
		Glucose
		Saccharide
		Hydroxyl group
		Hydrolysis
		Caramelization
		Dehydration
		Chlorophyll
		Glycogen

	C1	Cite 10 facts about the use of carbohydrates in the body.[1]
	C1	Identify the molecular structure of simple and complex carbohydrates. List some examples of each.
	C1	Write a paragraph describing the chemical reaction that occurs when plants produce carbohydrates.
	C1	State the equation for photosynthesis. Identify each step in the equation.
	C1	Identify the carbohydrates in a fast food meal.[2]

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COURSE:	Food Science	UNIT: **Food Chemistry**
COMPETENCY:	013.00 - C2	Explain the importance of carbohydrates in foods.
OBJECTIVE:	013.01 - C1	*Identify the chemical structure of simple and complex carbohydrates. (2)*

OUTLINE	BEHAVIOR	STRATEGIES
	C1	There are three essential nutrients which contribute calories to food; fat carbohydrate, and protein. Tell the amount of carbohydrates in a food and tell the caloric value of the carbohydrates.[3]
	C1	Select from a list, foods that provide the most energy, the second most, and the least.

RESOURCES:

Food Science and You, pp. 112-114.
Teachers Resource Guide, pp. 111-124.

Display Kit, "Sugar and Sweeteners"
Penn State Nutrition Center

Modern Biology, pp.49-50, 687-689

Self Assessments, "How Sweet It Is!! What is Your Sugar Intake"

[1]"The Winning Edge: The Role of Carbohydrates in Sports Nutrition"
[2]"Fast Food Meals" and "Tips for Fast Food Eating"
[3]"Calorie Detective"
Adolescent Nutrition Resource Packet
Penn State Nutrition Center

COURSE:	Food Science	UNIT: **Food Chemistry**
COMPETENCY:	013.00 - C2	Explain the importance of carbohydrates in foods.
OBJECTIVE:	013.02 - C2	*Explain the functions of sugar, starch, and pectin in food systems. (4)*

OUTLINE

Carbohydrates in Food Systems

- Sugar
  - Monosaccharides
    - Glucose
    - Fructose
    - Galactose
  - Disaccharides
    - Sucrose
    - Lactose
    - Maltose
  - Hydrolysis of sugar
  - Sweetness and solubility
  - Caramelization
  - Crystallization of sugar

BEHAVIOR	STRATEGIES
C1	Define the following terms: Gelatinization Paste Retrogradation Syneresis Hypoglycemia Hyperglycemia
C1	Name the carbohydrates studied in food science.
C2	Explain the function of sugar in food systems.
C2	Discuss sugar chemistry. List the products of the hydrolysis of sucrose, lactose, and maltose.
C1	Cite examples of monosaccharides and disaccharides.
C2	Discuss the properties of caramelization.
C2	Explain how temperature, agitation, and the presence of interfering agents affect crystal formation, after conducting Laboratory Experiment 7-1: Making Fondant, Food Science and You, pp.126-127.

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COURSE: Food Science — UNIT: **Food Chemistry**

COMPETENCY: 013.00 - C2 — Explain the importance of carbohydrates in foods.

OBJECTIVE: 013.02 - C2 — *Explain the functions of sugar, starch, and pectin in food systems. (4)*

OUTLINE	BEHAVIOR	STRATEGIES
Sugar, Starch and Pectin	C1	Describe the role of carbohydrates as an energy source.
Uses in the Body Energy source Glycogen Hypoglycemia Hyperglycemia Starch Structure of starch	C2	Explain the relationship between glucose, glycogen, the pancreas and diabetes. Identify the symptoms and control of diabetes. Discuss Type I and Type II diabetes.
Polymer Amylose Amylopectin	C2	Explain the function of starch in food systems.
Cooking with starch Gelatinization Retrogradation	C1	Tell why starches are not soluble in water.
Syneresis	C1	Describe the structure of amylose and amylopectin and how these structures affect cooking properties.
	C2	Summarize the effects of thickening agents on the final product, after conducting Laboratory Experiment 7-2: Thickening Agents, Food Science and You, pp.128-129.
	C2	Explain the function of pectin in food systems.

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COURSE:	Food Science	UNIT: **Food Chemistry**
COMPETENCY:	013.00 - C2	Explain the importance of carbohydrates in foods.
OBJECTIVE:	013.02 - C2	*Explain the functions of sugar, starch, and pectin in food systems. (4)*

OUTLINE	BEHAVIOR	STRATEGIES
	C2	Discuss the natural sources of pectin in foods.
	C2	Discuss the function of fiber in the diet.[1]
	C2	Interpret the fiber content in various foods. Recognize 10 facts about fiber.[2]
	C1	Identify your fiber intake by completing the "How Much Fiber" survey form.

RESOURCES:

Food Science and You, pp.115-130
Teacher's Resource Guide, pp.111-124

Display Kit: "Fiber"
Penn State Nutrition Center

Food Science

[1]"Fiber Tips"
[2]"How Much Fiber"
Self Assessments
Penn State Nutrition Center

COURSE: Food Science — UNIT: **Food Chemistry**

COMPETENCY: 014.00 - C3 — Explore the importance of lipids in foods.

OBJECTIVE: 014.01 - C3 — *Compare the properties of saturated and unsaturated fatty acids (2)*

OUTLINE	BEHAVIOR	STRATEGIES
Properties and Composition of Lipids Fatty Acids Saturated and Unsaturated Fats Single bond Double bond Fats and Oils Melting point Solidification point Triglycerides	C1	Define the following terms: Fats Oils Cracking Oxidation Hydrogenation Rate of Rancidity Lipoproteins Linoleic Acid Sweet Butter Congealing Point Fatty Acids Trans-Fatty Acids
	C1	Identify foods that contain different types of triglycerides. List foods which contain saturated and unsaturated fatty acids.
	C3	Develop a comparison chart illustrating the following characteristics for saturated and unsaturated fatty acids: - molecular structure - bonding - physical characteristics - food sources
	C3	Distinguish between the 3 classifications of fats; saturated, monounsaturated, and polyunsaturated.
	C2	Explain how butter and margarine differ.

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COURSE:	Food Science	UNIT: **Food Chemistry**
COMPETENCY:	014.00 - C3	Explore the importance of lipids in foods.
OBJECTIVE:	014.01 - C3	*Compare the properties of saturated and unsaturated fatty acids (2)*

OUTLINE	BEHAVIOR	STRATEGIES
	C3	Assess your intake of high-fat and low-fat foods.[1]
	C3	Analyze the effects of switching to low-fat milk.[2]
	C2	Explain the structural and functional differences in trans-fatty acids and other fatty acids.
	C1	Identify types of foods that contain fatty acids.

RESOURCES:

Food Science and You, pp.135-137
Teacher's Resource Guide, pp.125-137

Display Kit, "Fats"
Penn State Nutrition Center

Modern Biology, pp.50-51

[1] "Eating For Heart Health: Assessing High-fat and Low-fat Foods.
Self Assessments
Penn State Nutrition Center

"Targets to Shoot For"
Adolescent Nutrition
"Classification of Fats" and
[2] Nutrition Science Activity: The Effects of Switching to Lowfat Milk
Lab Experiments/Pen-Pencil Activities
Penn State Nutrition Center

COURSE:	Food Science	UNIT: **Food Chemistry**
COMPETENCY:	014.00 - C3	Explore the importance of lipids in foods.
OBJECTIVE:	014.02 - C3	*Investigate the effects of fat in food preparation. (4)*

OUTLINE	BEHAVIOR	STRATEGIES
Lipids in Food	C2	Explain the 5 functions of fat in food preparation.
Major Functions of Fat in Food Preparation Tenderizing Aeration Heat medium Emulsions Flavor Body Fat and You Fat in the diet Fat and heart disease	C1	Give the following information for vegetable oils, vegetable shortening, margarine, butter, and lard. - Type of lipid - Nutrients gained - Food source
	C1	Name an example of a natural emulsion that contains fat.
	C3	Conduct Laboratory Experiment 8-1: Comparison of Lipids in Cake, Food Science and You, pp.142-143, to compare the effects of different lipids to determine which is the most desirable to use in baking.
	C2	Explain why fats are used in cake recipes.
	C3	Observe the shortening effects of various lipids in pie crust while conducting Laboratory Experiment 8-2: The Tenderizing Effect of Lipids, Food Science and You, p.144.

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COURSE: Food Science

UNIT: **Food Chemistry**

COMPETENCY: 014.00 - C3 Explore the importance of lipids in foods.

OBJECTIVE: 014.02 - C3 *Investigate the effects of fat in food preparation. (4)*

OUTLINE	BEHAVIOR	STRATEGIES
	C3	Compare the melting points of various types of lipids. Determine the solidification points of fats at various temperatures.
	C3	Estimate your body composition of lean body mass and percent body fat.[1]
	C2	Discuss the functions of fats in the body.
	C3	Examine food labels to determine the type of lipids used in various food items.
	C3	Determine the type and caloric contribution of fats in various foods. Calculate the amount of fat in a daily menu.[2]
	C3	Investigate the types of vegetable oils used by local fast-food establishments.
	C3	Examine the relationship of cholesterol, plaque, atherosclerosis, and lipoproteins to heart disease. Discuss the importance of reducing fat.[2]

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COURSE:	Food Science	UNIT: **Food Chemistry**
COMPETENCY:	014.00 - C3	Explore the importance of lipids in foods.
OBJECTIVE:	014.02 - C3	*Investigate the effects of fat in food preparation. (4)*

OUTLINE	BEHAVIOR	STRATEGIES

RESOURCES:

Food Science and You, pp.131-137
Teacher's Resource Guide, pp.125-137

Nutrition Science Activity: Estimation of Body Composition by Anthropometry
Lab Experiments/Pen-Pencil Activities
Penn State Nutrition Center

[2]"Blood Cholesterol"
[2]"First Food Meals"
[2]"Calorie Detective"
Adolescent Nutrition
Penn State Nutrition Center

COURSE:	Food Science	UNIT: **Food Chemistry**
COMPETENCY:	014.00 - C3	Explore the importance of lipids in foods.
OBJECTIVE:	014.03 - C2	*Explain how oxidation can be controlled in foods. (1)*

OUTLINE	BEHAVIOR	STRATEGIES
Oxidation	C1	Define oxidation.
Effect of Oxidation on Flavor Rate of Rancidity	C2	Explain how oxidation can be controlled in food.
	C2	Discuss what happens to the flavor of food when fat oxidizes.
	C1	Describe the effects of water on the rate of rancidity.
	C2	Explain why potato chips are packaged in nitrogen.
	C2	Summarize the effects of light on flavor after conducting Experiment 20-1: Effect of Light on Flavor, Food Science and You, pp.330-331.

RESOURCES:

Food Science and You, pp.138, 330-331
Teacher's Resource Guide, 125-137,
290, 298

COURSE:	Food Science	UNIT: **Food Chemistry**
COMPETENCY:	015.00 - C2	Summarize the importance of protein in foods.
OBJECTIVE:	015.01 - C1	*Identify the chemical structure of protein and amino acids. (1)*

OUTLINE	BEHAVIOR	STRATEGIES
Structure and Composition of Proteins	C1	Identify the three categories of proteins.
Categories of Proteins Structural Body control Food Amino Acids Building blocks Peptide bonding	C1	Describe the chemical structure of of proteins. Identify the components of the following molecule: $C_{3932} H_{4816} O_{872} N_{780} S_8 F_4$. Tell what you know about the molecule above.
	C1	Tell why protein molecules are called macromolecules.
	C1	Name the groups of elements that identify an amino acids.
	C1	Recognize the essential and non-essential amino acids. Discuss their role in body health. Tell why only 8 of the 20 amino acids are essential.
	C1	Define peptide bonding.
	C1	Discuss the factors that cause peptide bonding to unfold (Ex. heat, acid, freezing, enzymes, agitation, irradiation, sound waves, pressure, salt).

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COURSE:	Food Science	UNIT: **Food Chemistry**
COMPETENCY:	015.00 - C2	Summarize the importance of protein in foods.
OBJECTIVE:	015.01 - C1	*Identify the chemical structure of protein and amino acids. (1)*

OUTLINE	BEHAVIOR	STRATEGIES

RESOURCES:

Food Science and You, pp.147-148
Teacher's Resource Guide, pp.138-150

Modern Biology, pp.52-54

COURSE:	Food Science	UNIT: **Food Chemistry**
COMPETENCY:	015.00 - C2	Summarize the importance of protein in foods.
OBJECTIVE:	015.02 - C2	*Explain what causes denaturation. (2)*

OUTLINE	BEHAVIOR	STRATEGIES
Denaturation	C2	Explain denaturation and coagulation and the causes of these reactions.
Denaturation of Protein Coagulation Denaturation by dry heat Other means of denaturation	C1	Identify methods by which denaturation can be accomplished (i.e. through heat, freezing, sodium and potassium (salt), pressure, sound waves, high or low acid.
	C2	Summarize the effects of acids on protein in egg white during cooking, after conducting Laboratory Experiment 9-2: The Effect of Acid on Protein, Food Science and You, pp.158.
	C2	Explain why protein must be denatured before coagulation.
	C2	Summarize the effects of heat on protein cookery. Cook fried eggs at different times and at varying temperatures. Compare the results.

RESOURCES:

Food Science and You, pp.149-150
Teacher's Resource Guide, pp.138-150

COURSE: Food Science — UNIT: **Food Chemistry**

COMPETENCY: 015.00 - C2 — Summarize the importance of protein in foods.

OBJECTIVE: 015.03 - C1 — *Describe ways in which protein is used in food products. (3)*

OUTLINE	BEHAVIOR	STRATEGIES
Proteins in Food and Nutrition	C1	Identify the proteins in flour and and their role in cooking.
Food Preparation Foams Gluten	C1	Summarize basic principles of protein cookery.
Protein and Nutrition Complete proteins Incomplete proteins	C1	State the impact of cooking methods on meat proteins.
Protein analogs Functions of Protein in the Body	C1	Summarize basic principles of protein cookery.
	C1	Describe the composition of eggs and cite implications for egg cookery.
	C1	Give a description of differences in the quality of egg foam after adding sugar at various points in the beating process, after conducting Laboratory Experiment 9-1: Egg Foam Stability, Food Science and You, pp.156-157.
	C1	Describe what happens as temperature rises during meat cookery.
	C1	Recognize complete and incomplete proteins. List sources of each.

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COURSE:	Food Science	UNIT: **Food Chemistry**
COMPETENCY:	015.00 - C2	Summarize the importance of protein in foods.
OBJECTIVE:	015.03 - C1	*Describe ways in which protein is used in food products. (3)*

OUTLINE	BEHAVIOR	STRATEGIES
	C1	Identify the function of protein in the body.
	C1	Give examples of Protein Recommended Dietary Allowances for individuals of varying ages.
	C1	Identify the amount and caloric contributions of proteins in fast foods.
	C1	Identify non-animal protein analogs.
	C1	Tell the amount of protein needed to build up your muscles.

RESOURCES:

Food Science and You, pp.150-159
Teacher's Resource Guide, pp.138-150

"Incredible Edible Egg"
North Carolina Egg Association

"If I want to Build Up My Muscles..."
"Fast Food Meals"
Adolescent Nutrition Resource Packet
Penn State Nutrition Center

COURSE:	Food Science	UNIT: **Food Chemistry**
COMPETENCY:	016.00 - C2	Discuss the role of enzyme reactions in food products.
OBJECTIVE:	016.01 - C1	*Describe how enzymes act as catalysts in chemical reactions. (2)*

OUTLINE	BEHAVIOR	STRATEGIES
Enzymes Chemical Reactions Protein catalyst Properties of enzymes Substrate Active sites Functions of Enzymes	C1	Define the following terms: Activation energy Active site Blanched Catalyst Coenzymes Curd Enzymatic Browning Papain Substrate
	C1	Enzymes are proteins that control chemical activity. Identify at least 5 other functions of enzymes. Describe the "lock and key" aspect of enzyme functioning.
	C1	Describe the role of coenzymes.
	C1	Tell what happens when an enzyme does not fit the substrate.
	C1	Describe 2 functions of enzymes in the body.
	C1	Describe the effects of natural occuring enzymes, ficin (figs), bromelin (pineapple), and papain (papyas) on gelatin.

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COURSE:	Food Science	UNIT: **Food Chemistry**
COMPETENCY:	016.00 - C2	Discuss the role of enzyme reactions in food products.
OBJECTIVE:	016.01 - C1	*Describe how enzymes act as catalysts in chemical reactions. (2)*

OUTLINE	BEHAVIOR	STRATEGIES
	C1	Define digestion. Label the parts of the digestive system. State the purpose of each part of the digestive system. Identify the organs that aid in the chemical changes of protein, fat, and carbohydrates during the process of digestion.
	C1	Describe the digestive process for large food molecules; fat, carbohydrates, and proteins. Conduct the Nutrition Science Lab: Digestion. Respond to the discussion questions.[1]
	C1	Point to the areas in the digestive system where macronutrients are broken down.

RESOURCES:

Food Science and You, pp.196-201
Teacher's Resource Guide, pp.180-192

[1] Nutrition Science Lab: Digestion
Lab Experiments/ Pen-Pencil Activities
Penn State Nutrition Center
Penn State Nutrition Center

Nutrition Science Lab: The Effects of Temperature and Concentration on Enzymatic Activity,
Lab Experiments/Pen-Pencil Activities
Penn State Nutrition Center

Modern Biology, pp.53-54

COURSE:	Food Science	UNIT: **Food Chemistry**
COMPETENCY:	016.00 - C2	Discuss the role of enzyme reactions in food products.
OBJECTIVE:	016.02 - C2	*Identify factors that affect enzyme activity. (3)*

OUTLINE	BEHAVIOR	STRATEGIES
Enzymatic Activity	C1	Name 3 factors that affect enzyme activity.
Factors that Affect Enzyme Activity Temperature pH Water	C2	Explain how temperature affects enzyme activity after conducting the Nutrition Science Lab: Effects of Temperature and Concentration on Enzymatic Activity.[1]
	C2	Illustrate, using a diagram, how pH influences enzyme activity. Tell the pH most appropriate for enzyme activity.
	C2	Explain the effects of blanching on decreasing or stopping enzyme activity, after conducting Laboratory Experiment 12-2: Effect of Blanching on Enzymes, Food Science and You, p.208.
	C2	Explain the best means of stopping enzyme activity in dried fruits and vegetables.

RESOURCES:

Food Science and You, pp.202-204, 208
Teacher's Resource Guide, pp.180-192

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[1] Nutrition Science Lab: The Effects of Temperature and Concentration on Enzymatic Activity,
Lab Experiments/Pen-Pencil Activities
Penn State Nutrition Center

COURSE:	Food Science	UNIT: **Food Chemistry**
COMPETENCY:	016.00 - C2	Discuss the role of enzyme reactions in food products.
OBJECTIVE:	016.03 - C2	*Explain how enzyme reactions are involved in food production. (2)*

OUTLINE	BEHAVIOR	STRATEGIES
Enzyme Activity in Food	C1	Describe the enzyme activity that takes place in baking yeast bread.
Enzyme Reactions in Food Production Yeast bread	C2	Explain how enzymes are used to tenderize meats.
Tenderizing Enzymatic browning	C2	Summarize effective and ineffective techniques to prevent browning in fruits and vegetables, after conducting Laboratory Experiment 12-1: Enzymatic Browning, Food Science and You, pp.206-207.
	C2	Explain at least 3 techniques to denature enzymes.
	C2	Describe the process of enzymatic browning (laboratory experiment).[1]
	C2	Explain the use of ascorbic acid, citric acid, and or acetic acid in enzymatic browning.
	C2	Explain the role of oxygen in the browning reaction.

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COURSE:	Food Science	UNIT: **Food Chemistry**
COMPETENCY:	016.00 - C2	Discuss the role of enzyme reactions in food products.
OBJECTIVE:	016.03 - C2	*Explain how enzymes reactions are involved in food production. (2)*

OUTLINE	BEHAVIOR	STRATEGIES
	C1	Name some food processes in which enzymatic browning is undesirable. Identify reasons for not using enzymatic browning in the food processes identified above.

RESOURCES:

Food Science and You, pp.204-207
Teacher's Resource Guide, pp.180-192

[1]Laboratory Experiment:
'What is Enzymatic Browning'
Institute of Food Technologists

COURSE:	Food Science	UNIT: **Food Chemistry**
COMPETENCY:	017.00 - C3	Analyze the functions of minerals and vitamins.
OBJECTIVE:	017.01 - C2	*Discuss the interrelationship between vitamins and minerals in food preparation. (2)*

OUTLINE	BEHAVIOR	STRATEGIES
	C1	Describe water and fat soluble vitamins in each category. Identify the major minerals and trace elements, their chemical symbols, food sources, and deficiency diseases that result from a lack of sufficient quantities.
	C1	Describe the advantages of obtaining the RDA of vitamins and minerals from food sources rather than relying on tablets.
	C2	Explain the interrelationship between vitamin C, iron, and copper. Discuss the effect of tea on the absorption of minerals. Describe the relationship between zinc and vitamin A.
	C2	Summarize the effects of vitamin D on calcium and phosphorus. Explain the effect of protein on minerals and vitamins.

RESOURCES:

Food Science and You, pp.160-171
Teacher's Resource Guide, pp.151-165

COURSE:	Food Science	UNIT: **Food Chemistry**
COMPETENCY:	017.00 - C3	Analyze the functions of minerals and vitamins.
OBJECTIVE:	017.02 - C3	*Explore the effects of heat, light, and pH on the stability of vitamins and minerals. (3)*

OUTLINE	BEHAVIOR	STRATEGIES
Effect of Heat, Light, and pH On Nutrients	C3	Define the following terms: Titration Casein Rennin
Titration of Vitamin C Calcium in Milk	C3	Determine the effects of heat on vitamin C by titrating heated and unheated samples of apples and orange juice (Laboratory Experiment 10-1: Titration of Vitamin C, Food Science and You, pp.172-173).
	C3	Demonstrate a simple semi-quantitative method for testing for vitamin C. Compare the vitamin C content of different beverages.[1]
	C3	Observe the effects of calcium ions on the coagulation of milk. Laboratory Experiment 10-2: Calcium and Milk, Food Science and You, p.174.
	C3	Complete the Nutrition Science Activity, "Soft Drink Trivia".[2]

RESOURCES:

Food Science and You, pp.172-174
Teacher's Resource Guide, pp.151-165

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[1] Nutrition Science Lab: Testing for Vitamin C in Beverages

[2] Nutrition Science Activity: "Soft Drink Trivia", Lab Exper./Pen-Pencil Activities, Penn State Nutrition Center

COURSE:	Food Science	UNIT: **Food Chemistry**
COMPETENCY:	018.00 - C3	Evaluate the use of additives in food.
OBJECTIVE:	018.01 - C3	*Explore the use of additives in foods. (3)*

OUTLINE	BEHAVIOR	STRATEGIES
Food Additives What is a Food Additive? Definition	C3	Read "Chemicals We Eat". Identify 4 functions of additives. Complete worksheets A, B, and C.[1]
Purpose Examples Using Additives Function of additives	C3	Examine food labels, locate within the list of ingredients, and identify the functions of each food additive.
Preservatives Colors Flavors	C2	Discuss the benefits and risks of food additives.
Antioxidants Stabilizers Buffers Sweeteners	C3	Assess your sodium intake. Identify 6 facts regarding the use of sodium in daily diets.[2]
Pros and cons	C3	Sodium is often a hidden additives. Bring in a food label or container of a product in which you did not expect to find sodium. Discuss the problems a person with a weight or heart problem may have with hidden additives.
	C3	Research one food additive in the following areas: Safety testing History Limit for use Food Sources Function of the additive.

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COURSE:	Food Science	UNIT: **Food Chemistry**
COMPETENCY:	018.00 - C3	Evaluate the use of additives in food.
OBJECTIVE:	018.01 - C3	*Explore the use of additives in foods. (3)*

OUTLINE	BEHAVIOR	STRATEGIES
	C1	Identify additives that have nutritional value.
	C3	Observe the effects of various additives on vanilla pudding (Laboratory Experiment 21-1: Pudding Mixes and Additives, Food Science and You, pp.344-345.
	C3	Compare tofu made with calcium sulfate and tofu made with magnesium sulfate (Laboratory Experiment 12-2: Effects of Minerals on Proteins, Food Science and You, pp.346-347.

RESOURCES:

Food Science and You, pp.337-348
Teacher's Resource Guide, pp.302-315

Video - "What's in the Food?"
Learning Seed

[1] Nutrition Science Activity: Chemical We Eat. Lab Experiments/Pen-Pencil Activities, Penn State Nutrition Center

[2] Assess Your Sodium Intake
Self Assessments
Penn State Nutrition Center

COURSE:	Food Science	UNIT: **Food Chemistry**
COMPETENCY:	018.00 - C3	Evaluate the use of additives in food.
OBJECTIVE:	018.02 - C2	*Explain the role of governmental regulations regarding food additives. (1)*

OUTLINE	BEHAVIOR	STRATEGIES
Regulating Additives	C1	Identify international organizations that regulate the use of additives.
International Level Food and Agriculture Organization (FAO) World Health Organization (WHO)	C2	Discuss the role of the Food and Drug Administration (FDA) in regulating food additives.
United States Food and Drug Administration (FDA)	C2	Explain the purpose of the GRAS List. Tell whether this list includes additives.
	C2	Discuss the Delaney Anti-Cancer Clause. Explain how this clause affects substances regarded as additives.
	C3	Outline a list of warnings one may find on food packages' regarding food additives.
	C2	Summarize the history of the Food and Drug Administration.

RESOURCES:

Food Science and You, pp.334-336
Teacher's Resource Guide, pp.302-315

COURSE: Food Science — UNIT: **Leadership and Citizenship**

COMPETENCY: 019.00 - C3P — Work with others informally to accomplish group goals.

OBJECTIVE: 019.01 - C3P — *Use information to determine group action. (2)*

OUTLINE	BEHAVIOR	STRATEGIES
Use Information Acquire and Evaluate Organize and Maintain Interpret and Communicate Written Oral Graphic Pictorial Multi-media form Process Information with Computers	C3	Relate the FHA/HERO planning process and symbols as one method for using information to determine group action.
	C3P	Collect ideas for a group service project, using a suggestion box or similar concept. Evaluate the ideas and select one to use as an FHA/HERO project that addresses a student need.
	C3P	Use the computer to maintain and process information for group activities and projects.
	C3P	Plan and implement an earth friendly project through FHA/HERO. Base your selection on the general consensus of the organization.
	C3P	Use **who, what, why, when, where, and how,** in determining group action for a project. Conduct the Student Body for assistance in forming a plan of action.

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COURSE:	Food Science	UNIT: **Leadership and Citizenship**
COMPETENCY:	019.00 - C3P	Work with others informally to accomplish group goals.
OBJECTIVE:	019.01 - C3P	*Use information to determine group action. (2)*

OUTLINE	BEHAVIOR	STRATEGIES
	C3P	Present the results of a group project using two or more of the following methods in your presentation: Oral Written Graphics Pictorial Multimedia Accomplish this through an FHA/HERO competitive event.
	C3P	Plan and implement a group project that promotes community spirit and raises funds for a charitable event.
	C3P	Develop a filing system for storing information on FHA/HERO activities and projects. Use this information for planning and evaluating future projects.

RESOURCES:

SCANS U.S. Department of Labor

Food Science and You Teacher's Resource Guide for Activity Suggestions

FHA/HERO State and National Handbook

Local School Student Body

COURSE:	Food Science	UNIT: **Leadership and Citizenship**
COMPETENCY:	019.00 - C3P	Work with others informally to accomplish group goals.
OBJECTIVE:	019.02 - C3P	*Use interpersonal communication skills to accomplish group goals. (2)*

OUTLINE	BEHAVIOR	STRATEGIES
Interpersonal Communication Skills Team Members Leaders Leadership styles Autocratic Democratic Laissez-faire Followers Skills Serves Clients/Customers Collaborate/Negotiate Works with Diverse People	C3	Examine leadership styles such as autocratic, democratic, and laissez-faire. Determine the most effective style(s) for your FHA/HERO organization.
	C3P	Interview different school leaders and determine leadership styles. Suggested interviewees include: Administration Custodial Staff Cafeteria Staff Student Leaders
	C3	Analyze why the following traits enhance leadership skills: Loyalty Sensitivity Patience Impartiality Sense of Humor Democratic Attitude Identify other qualities you feel are important for quality leadership.
	C3P	Employ basic communication skills to manage a group activity. Include the following: listening, speaking, writing, and reading.

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COURSE:	Food Science	UNIT: **Leadership and Citizenship**
COMPETENCY:	019.00 - C3P	Work with others informally to accomplish group goals.
OBJECTIVE:	019.02 - C3P	*Use interpersonal communication skills to accomplish group goals. (2)*

OUTLINE	BEHAVIOR	STRATEGIES
	C3P	Develop a conflict resolution team/committee. Develop strategies that will assist groups or individuals work through a conflict situation. Demonstrate effective strategies through role play.
	C3	Create an awareness campaign within your school/community to provide information and tips on food science related concerns. Explore possible solutions through FHA/HERO.
	C3	Determine similarities of individuals within your FHA/HERO organization. Use activities such as *Honoring Differences or United Now in Togetherness* to accomplish this goal. Refer to The Winner's Circle: Yes I Can! or NC-FHA/HERO state projects for directions.

RESOURCES:

FHA/HERO Chapter Handbook pp.79-90
Leadership Development pp.8-11
The Winner's Circle: Yes I Can! pp.120-121

COURSE:	Food Science	UNIT: **Leadership and Citizenship**
COMPETENCY:	019.00 - C3P	Work with others informally to accomplish group goals.
OBJECTIVE:	019.03 - C3P	*Manage resources to achieve group goals. (2)*

OUTLINE	BEHAVIOR	STRATEGIES
Resource Management	C3P	Construct a time-line for an FHA/HERO service project.
Allocation of Resources Time Money Material and facility Human Management of Resources Plan	C3	Examine potential FHA/HERO projects. Estimate the time required to complete a project. Consider using computer software to help plan the project, work schedule and time-lines.
Control/use Evaluate	C3P	Using a service project selected by FHA/HERO members, prepare a budget, including cost and revenue forecasts. Keep detailed records to track budget performance. Make appropriate adjustments as needed.
	C3	Use a software package to design and create an FHA/HERO document that includes narratives and graphics.
	C3	Develop an FHA/HERO organizational plan to include the selection of officers, committees, and teams.

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COURSE:	Food Science	UNIT: **Leadership and Citizenship**
COMPETENCY:	019.00 - C3P	Work with others informally to accomplish group goals.
OBJECTIVE:	019.03 - C3P	*Manage resources to achieve group goals. (2)*

OUTLINE	BEHAVIOR	STRATEGIES
	C3P	Carry out an FHA/HERO project using available human resources. Develop a staffing plan after assessing knowledge and skills possessed by members. This may be achieved through surveys and interviews. Write job descriptions for tasks. Encourage member participation. Conduct a performance evaluation at the completion of the project. Consider using one of the NC-FHA/HERO State/National Projects.
	C3	Develop a fund raising project for FHA/HERO. Select a project suitable to available human resources. Construct time-lines, staffing plans, and conclude with a performance evaluation.

(CONTINUED)

COURSE:	Food Science	UNIT: **Leadership and Citizenship**
COMPETENCY:	019.00 - C3P	Work with others informally to accomplish group goals.
OBJECTIVE:	019.03 - C3P	*Manage resources to achieve group goals. (2)*

OUTLINE	BEHAVIOR	STRATEGIES
	C3P	List all of the expenses you and two or more friends have on a regular basis - weekly, monthly, etc. Categorize the list such as lunch, school, supplies, clothing, etc. Develop a work sheet that could be used by teens throughout your school in helping to determine and plan for financial needs. Write an article for the school newspaper about this activity and include the work sheet and an explanation on how it can be used.

RESOURCES:

Financial Fitness pp.25-33

Work and Family Supplement (SDPI)

COURSE:	Food Science	UNIT: **Leadership and Citizenship**
COMPETENCY:	020.00 - C3P	Use parliamentary law to accomplish group goals.
OBJECTIVE:	020.01 - C3	*Examine organizational rules. (2)*

OUTLINE	BEHAVIOR	STRATEGIES
Organizational Rules Charters Constitution and/or By-Laws, Rules of Order, and Standing Rules Rituals and Symbols	C3	Examine the symbols, rituals, mission and purposes of FHA/HERO. Determine the benefits of being a member. Play "FHA/-GO" to test your knowledge!
	C3	Research the charter of your FHA/HERO chapter.
	C3	Differentiate among constitution, by-laws, rules, of order, and standing rules.
	C3	Explore various organizations to determine the following: — Is it a school or community organization? — How are the organizations affiliated: local, state, national? — Do these organizations involve youth? — How are these organizations similar? Different? — How do they benefit members? Schools? Community? — How do you become a member? — What are the advantages of being a member of each organization?

(CONTINUED)

COURSE:	Food Science	UNIT: **Leadership and Citizenship**
COMPETENCY:	020.00 - C3P	Use parliamentary law to accomplish group goals.
OBJECTIVE:	020.01 - C3	*Examine organizational rules. (2)*

OUTLINE	BEHAVIOR	STRATEGIES
	C3	Consider why you would like to become a member of an organization. Membership is a personal choice. Examine reasons to join an organization such as: A sense of belonging Expanded opportunities Recognition Opportunities for self-expression To support a belief or cause
	C3	Examine the rules in FHA/HERO. Compare them to another school organization such as the student government association. Compare their differences and commonalities.
	C3	Justify why social organizations have mission statements, rituals, and symbols.
	C3	Examine the FHA/HERO emblem by using the emblem ceremony.

RESOURCES:

FHA/HERO Chapter Handbook pp.97-105
Work and Family Supplement

COURSE:	Food Science	UNIT: **Leadership and Citizenship**
COMPETENCY:	020.00 - C3P	Use parliamentary law to accomplish group goals.
OBJECTIVE:	020.02 - C3P	*Demonstrate handling organizational business. (2)*

OUTLINE	BEHAVIOR	STRATEGIES
Organizational Business	C1	Identify basic vocabulary used with parliamentary procedure.
Parliamentary Procedure Vocabulary Purpose and principles Agenda Motion Voting	C3	Investigate how parliamentary procedure provides an orderly system for accomplishing organizational business. Explain how it protects the rights of its members. In your explanation show the following: the right of the minority, the rule of the majority, and partiality to none.
	C2	Discuss the four basic principles of parliamentary law: — Courtesy and justice for all — One item of business at a time — The minority must be heard — The majority must prevail
	C3P	Apply the various methods of voting in parliamentary law during an FHA/HERO meeting.
	C3P	Demonstrate the steps for making and processing a motion.

(CONTINUED)

COURSE: Food Science

UNIT: **Leadership and Citizenship**

COMPETENCY: 020.00 - C3P

Use parliamentary law to accomplish group goals.

OBJECTIVE: 020.02 - C3P

Demonstrate handling organizational business. (2)

OUTLINE	BEHAVIOR	STRATEGIES
	C3P	Use parliamentary procedure throughout organizational meetings. When possible, practice using it during class activities.
	C3P	Prepare an agenda or a planning sheet to assist with organization, setting a time frame, and establish FHA/HERO meeting goals. Evaluate the effectiveness of the agenda and/or planning sheet.

RESOURCES:

FHA/HERO Chapter Handbook
pp.57-58, 67-74

Robert's Rules of Order (Newly Revised)

Work and Family Supplement

Video - "Level with Me", Learning Seed

Video - "Ethics: Code of Conduct"
McGraw-Hill

Video - "Say It Better: Fearless Public Speaking", Learning Seed

COURSE:	Food Science	UNIT: **Food Mixtures**
COMPETENCY:	021.00 - C3	Explore mixtures in food products and preparation.
OBJECTIVE:	021.01 - C1	*Identify the solvent and solute in a given substance. (2)*

OUTLINE	BEHAVIOR	STRATEGIES
Solutes and Solvents Definitions Solutions Solute	C1	Define the following terms: Solution Solute Solvent
Solvent Types and Forms of Solutions in Foods Liquid	C1	Identify the solvent and solute(s) of the ingredients listed on the labels of soft drinks and fruit drinks.
Gas Solid -liquid Liquid - gas	C1	Recognize the solute and solvent after tasting a prepared solution of sweetened water and salt water (1 tablespoon per pint of warm water).
	C1	Label salt and sugar containers as solute. Label a hot water pitcher as solvent. Mix the portions as follows: — 1 Tbl. salt + 1 pt. hot water — 1 Tbl. sugar + 1 pt. hot water. Identify the solvent and the solute.
	C1	Identify the solvents and solutes in a picture or collage of solutions (i.e. juice drinks, coffee, tea, gelatin).
	C1	Recognize the gas in the foam of a shaken canned soft drink as a solvent or solute.

(CONTINUED)

COURSE:	Food Science	UNIT: **Food Mixtures**
COMPETENCY:	021.00 - C3	Explore mixtures in food products and preparation.
OBJECTIVE:	021.01 - C1	*Identify the solvent and solutes in a given substance. (2)*

OUTLINE	BEHAVIOR	STRATEGIES

RESOURCES:

Food Science and You, pp.210-212
Teachers Resource Guide, pp.193-207

Experimental Foods Laboratory Manual

Food Science

Foods: Experimental Perspectives

COURSE:	Food Science	UNIT: **Food Mixtures**
COMPETENCY:	021.00 - C3	Explore mixtures in food products and preparation.
OBJECTIVE:	021.02 - C3	*Analyze the effects of concentrations on the physical properties of solutions.(4)*

OUTLINE	BEHAVIOR	STRATEGIES
Effects of Solutes Concentrations Concentration of Solutions Definitions Mass percent Saturated Unsaturated Calculation of mass Percent Types of solutions Saturated Unsaturated Solubility of solutes	C3	Prepare 3 salt water solutions: 1. 1 Tbl. salt per 1 pt. hot water 2. 3 Tbl. salt per 1 pt. hot water 3. 5 Tbl. salt per 1 pt. hot water. Pour into separate ice cube trays. Label and freeze. During the same lab experiment, prepare 3 sugar water solutions: 1. 1 Tbl. sugar per 1 pint hot water 2. 3 Tbl. sugar per 1 pint hot water 3. 5 Tbl. sugar per 1 pt. hot water. Pour into separate ice cube trays. Label and freeze. Also pour a 1 pt. sample of plain water into ice cube trays. Label and freeze. Observe and record the degree the solutions have frozen at various time periods. Which freezes quickest? Which solution freezes slowest? Discuss reasons for variations in freezing points of solutions.
	C3	Observe that water solutions do not boil at the same temperature as pure water and that boiling point varies with the solution's concentration. Conduct Experiment 13-1: Boiling Points of Sugar and Salt Solutions, Food Science and You, pp.221).

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COURSE:	Food Science	UNIT: **Food Mixtures**
COMPETENCY:	021.00 - C3	Explore mixtures in food products and preparation.
OBJECTIVE:	021.02 - C3	*Analyze the effects of concentrations on the physical properties of solutions. (4)*

OUTLINE	BEHAVIOR	STRATEGIES
	C2	Explain the concept of mass percent as a means of calculating the concentration of solutions.
	C3	Calculate the mass percent of a solute in a solution. *Example:* 15g sodium chloride (NaCl) in 85g H_2O. *Formular:* Mass % of Solute A = $\frac{\text{Mass of Solute A} \times 100}{\text{Total Mass of the Solution}}$ *Answer:* $\frac{15g \times 100}{85g. + 15g. = 100} = 15\%$
	C3	Calculate the mass percent of sugar if 40g. sugar are dissolved in 50g. water. *Answer:* $\frac{40g. \times 100}{90} = 44\%$

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COURSE:	Food Science	UNIT: **Food Mixtures**
COMPETENCY:	021.00 - C3	Explore mixtures in food products and preparation.
OBJECTIVE:	021.02 - C3	*Analyze the effects of concentrations on the physical properties of solutions. (4)*

OUTLINE	BEHAVIOR	STRATEGIES
	C2	Distinguish between unsaturated, saturated, supersaturated solutions. *Step 1:* Add a few grains of salt to 1c. of water to obtain an unsaturated solution. *Step 2:* Continue to add salt. Stir to dissolve. until all salt will not dissolve to obtain a saturated solution. *Step 3:* Heat water to dissolve salt crystals. When the crystals dissolve, the solution is supersaturated.
	C3	Place a bottled soft drink in the refrigerator and leave one at room temperature for 1-2 days (the longer the time, the more difference observed). Taste the samples from both bottled and discuss the differences.
	C3	Use cookbooks to locate recipes with supersaturated solutions (i.e. candy, sugar syrup, cooked icing, food preservation syrup, etc.

(CONTINUED)

COURSE: Food Science UNIT: **Food Mixtures**

COMPETENCY: 021.00 - C3 Explore mixtures in food products and preparation.

OBJECTIVE: 021.02 - C3 *Analyze the effects of concentrations on the physical properties of solutions. (4)*

OUTLINE	BEHAVIOR	STRATEGIES

RESOURCES:

Food Science and You, pp.213-214
Teachers Resource Guide, pp.193-207

Food Science

Film: "Chemistry Solutions". Coronet Films/Video, 23 Minutes, Simon & Schuester Co.

Experiments in Food Science, Institute of Food Technologists.

COURSE:	Food Science	UNIT: **Food Mixtures**
COMPETENCY:	021.00 - C3	Explore mixtures in food products and preparation.
OBJECTIVE:	021.03 - C3	*Examine the properties of colloidal dispersions. (2)*

OUTLINE	BEHAVIOR	STRATEGIES
Colloidal Dispersions	C2	Discuss the difference between solutions and colloidal dispersions,
Properties of Colloids Particles of dispersions Dispersions Scatters light No Effect on freezing point and boiling points Aggregates Tyndall Effect	C1	Cite food examples of the following types of colloids: — Foam (chipped cream suds, marshmallow) — Emulsions (milks, margarine, cheese, butter) — Sols (jellies)
	C3	Demonstrate the Tyndall effect by shinning a flashlight through a colloidal dispersion (i.e. milk, egg white, gelatin, jelly, etc.). The path of light will be visible (see example on p.216, Food Science and You. Then shine the light on a simple solution of salt water. Observe that the path of light is visible in the colloidal dispersion but not in the salt solution.
	C3	Compare the visibility of the colloidal dispersion and the salt solution to the visibility of sunbeam through a window on dust particles. Discuss why light passes through the salt solution but not through the colloidal dispersion.

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COURSE:	Food Science	UNIT: **Food Mixtures**
COMPETENCY:	021.00 - C3	Explore mixtures in food products and preparation.
OBJECTIVE:	021.03 - C3	*Examine the properties of colloidal dispersions. (2)*

OUTLINE	BEHAVIOR	STRATEGIES
	C1	List examples of other food products which would produce the Tyndall effect (milk, jelly, gelatin, egg white).

RESOURCES:

Food Science and You, pp.215-216
Teachers Resource Guide, pp.193-207

Food Science

COURSE:	Food Science	UNIT: **Food Mixtures**
COMPETENCY:	022.00 - C3	Examine the use of gels, foams, and emulsions.
OBJECTIVE:	022.01 - C1	*Identify examples of gels, foams, and emulsions. (1)*

OUTLINE	BEHAVIOR	STRATEGIES
Gels, Foams, and Emulsions	C1	Define the following terms: Gel Foam Emulsion
	C1	Identify 4 examples of gels.
	C1	Recognize 3 examples of foams.
	C1	Cite 4 examples of emulsions.
	C1	Label the part of an emulsifier on a diagram. Explain the relationship of the parts to each other.

RESOURCES:

Food Science and You, pp.216-220
Teachers Resource Guide, pp.193-207

Food Science

Foods: Experimental Perspectives.

COURSE:	Food Science	UNIT: **Food Mixtures**
COMPETENCY:	022.00 - C3	Examine the use of gels, foams, and emulsions.
OBJECTIVE:	022.02 - C3	*Determine the role of gels, foams, and emulsions. (2)*

OUTLINE	BEHAVIOR	STRATEGIES
Role of Gels, Foams, and Emulsions in Foods	C2	Summarize the use of gels in food preparation and production.
Gels in Foods Foams in Foods Emulsions in Foods Preparation Food emulsions	C3	Demonstrate the use of a foam in a food product. Explain the possible results of the products if the foam had been omitted
Homogenized milk Mayonnaise Butter/margarine	C2	Discuss the difference between temporary and permanent emulsions.
Whipped cream and other foams Gravies/sauces	C3	Demonstrate a temporary emulsion by mixing oil and vinegar in a jar. Let it sit and describe what happens. Explain why?
	C3	Contrast a temporary emulsion with a permanent emulsion by demonstrating how oil and vinegar becomes a permanent emulsion with the addition of an emulsifier.
	C2	Discuss the role of two miscible liquids (i.e. juice, water), and two immiscible liquids (i.e. oil, water). Discuss the role of an emulsifier in an emulsion.

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COURSE: Food Science UNIT: **Food Mixtures**

COMPETENCY: 022.00 - C3 Examine the use of gels, foams, and emulsions.

OBJECTIVE: 022.02 - C3 *Determine the role of gels, foams, and emulsions. (2)*

OUTLINE	BEHAVIOR	STRATEGIES
	C3	Compare the properties of emulsions prepared using a variety of methods of adding the oil to the other ingredients. Conduct Laboratory Experiment 13-2: Making an Emulsion. Food Science and You, p.222.
	C3	Evaluate variations of the mayonnaise made in the Lab Exp. 13-2.
	C3	Compare the results of Lab Exp. 13-2 to various commercial products. Similarities? Differences?
	C3	Complete the crossword puzzle on p.201-202, Teacher's Resource Guide, to reinforce concepts.

RESOURCES:

Food Science and You, pp.220-222
Teachers Resource Guide, pp.193-207

Foods: Experimental Perspectives

Food Science

COURSE:	Food Science	UNIT: **Food Mixtures**
COMPETENCY:	023.00 - C3	Evaluate the effects of leavening agents on baked goods.
OBJECTIVE:	023.01 - C2	*Explain the function and properties of natural and chemical leavening agents. (3)*

OUTLINE	BEHAVIOR	STRATEGIES
Leavening Agents Chemical Leavening Agents Baking soda Baking powder Single-acting Double-acting Natural Leavening Agents	C1	Define the following terms: Baking powder Baking soda Fermentation Quick breads Single-acting baking powder Double-acting baking powder
Steam (water vapor) Air Yeast	C1	Identify examples of chemical leavening agents. Describe the properties of each.
	C1	Identify the chemical formular for baking soda, baking powder, and ammonium bicarbonate. List the ingredients in each.
	C2	Interpret the scientific name of baking soda and baking powder. Recognize the function of ammonium bicarbonate and the chemical reaction that occurs in baked goods.
	C1	Identify examples of natural leavening agents and describe the properties of each. Explain why baking soda is used with an acid in baked goods.

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COURSE: Food Science UNIT: **Food Mixtures**

COMPETENCY: 023.00 - C3 Evaluate the effects of leavening agents on baked goods.

OBJECTIVE: 023.01 - C2 *Explain the function and properties of natural and chemical leavening agents. (3)*

OUTLINE	BEHAVIOR	STRATEGIES
	C1	Cite examples of ingredients that could be added to sodium bicarbonate to prevent the bad taste and yellowish color that results in baked goods.
	C2	Illustrate the equation for the breakdown of sodium bicarbonate by heat. $(\underset{\text{Sodium Bicarbonate}}{2NaHCO_3} \overset{\text{(Heat)}}{---------} \underset{\text{Carbon Dioxide}}{CO_2} + \underset{\text{Sodium Carbonate}}{Na_2CO_3} + \underset{\text{Water Vapor}}{H_2O})$.
	C1	List examples of natural leavening agents. Describe the properties and function of each.
	C1	Identify baked goods in which steam, air, and yeast are used as leavening agents.

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COURSE: Food Science — UNIT: **Food Mixtures**

COMPETENCY: 023.00 - C3 — Evaluate the effects of leavening agents on baked goods.

OBJECTIVE: 023.01 - C2 — *Explain the function and properties of natural and chemical leavening agents. (3)*

OUTLINE	BEHAVIOR	STRATEGIES
	C2	Explain the historical use of yeast as a leavening agent.
	C2	Fermentation is a chemical reaction that splits complex organic compounds into simpler substances. Explain the relationship between yeast and fermentation.
	C1	Recognize the best temperature for yeast fermentation (27 C). Discuss the effect of high heat on yeast.
	C1	Identify the types of dough and batters used in making quick breads.
	C1	Recognize the leavening agents used in various recipes of baked goods.
	C2	Explain why batters must be thin when steam is the leavening agent.

RESOURCES:

Food Science and You, pp.224-233
Teachers Resource Guide, pp.208-222

Food For Today

Food Science

COURSE:	Food Science	UNIT: **Food Mixtures**
COMPETENCY:	023.00 - C3	Evaluate the effects of leavening agents on baked goods.
OBJECTIVE:	023.02 - C3	*Compare the effects of chemical and natural leavening agents on baked products. (3)*

OUTLINE	BEHAVIOR	STRATEGIES
Comparison of Leavening Agents Chemical Natural	C3	Compare the approximate amounts of carbon dioxide released from three leavening agents: baking soda cream of tartar albumin solution
	C3	Conduct Laboratory Experiment 14-2: Production of Carbon Dioxide Using Baking Powders, Food Science and You, p.236.
	C3	Repeat Lab Experiment 14-2 using baking powders with varying temperatures of :10 C, 40 C, and 60 C. Summarize the effect of varying temperatures on products.
	C3	Compare the effects of various baking powders. Make the same cake recipe used in Lab Experiment 8-1. Conduct Laboratory Experiment 14-1: Comparison of Leavening Agents, Food Science and You, p.234-235.

RESOURCES:

Food For Today

Food Science and You, pp.234-237

Teachers Resource Guide, pp.208-222

Food Science

COURSE: Food Science — UNIT: **Food Microbiology**

COMPETENCY: 024.00 - C1 — Describe microorganisms in foods.

OBJECTIVE: 024.01 - C1 — *Identify the four types organisms. (1)*

OUTLINE	BEHAVIOR	STRATEGIES
Microorganisms in Foods Types of Organisms Yeasts Molds Bacteria Viruses	C1	Define the following terms: Microbiology Organisms Microorganisms
	C1	Describe a yeast ferm.
	C1	Describe a bacterial ferm.
	C1	Describe a mold ferm.
	C1	Define viruses. Tell the difference between viruses, molds, bacteria, and yeasts.
	C1	Describe environmenal factors (i.e. temperature) that affect the growth of microorganisms in foods.
	C1	Recognize microscopic views of bacteria, viruses, yeasts, and molds.

RESOURCES:

Food Science and You, pp.274-282
Teacher's Resource Guide, pp.250-262

Food Science

Food For Today

Food-borne Illness Investigations, Instructor's Manual

COURSE:	Food Science	UNIT: **Food Microbiology**
COMPETENCY:	024.00 - C1	Describe microorganisms in foods.
OBJECTIVE:	024.02 - C1	*Identify the positive and negative effects of yeasts, molds, bacteria, and viruses in foods. (3)*

OUTLINE	BEHAVIOR	STRATEGIES
Function of Microroganisms in Foods	C1	Describe the positive and negative effects of yeasts on foods.
Positive Effects Fermentation of foods Produce foods	C1	Tell the proper temperature to kill yeast organisms. (136°F/156°C)
Negative Effects Food spoilage Unfavorable odor, flavor, appearance	C1	Identify food in which yeast organisms may have positive effects; negative effects. Tell how yeasts, molds, bacteria, and viruses change the flavor, smell, and appearance of foods.
	C1	Describe the positive and negative effects of bacteria on foods.
	C1	Cite examples of foods in which bacteria are commonly found and used to produce foods (i.e. butter, sour cream, buttermilk, pickles, vinegar).
	C1	Describe the positive and negative effects of molds on foods.
	C1	Identify foods on which molds may be found. Tell what should be done if mold appeared on hard cheese, soft cheese, and soft foods (i.e. yogurt, sour cream, jams, jellies, tomatoes, cucumbers).

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COURSE:	Food Science	UNIT: **Food Microbiology**
COMPETENCY:	024.00 - C1	Describe microorganisms in foods.
OBJECTIVE:	024.02 - C1	*Identify the positive and negative effects of yeasts, molds, bacteria, and viruses in foods. (3)*

OUTLINE	BEHAVIOR	STRATEGIES
	C1	Identify molds and their classifications.
	C1	Describe the positive and negative effects of viruses on foods.

RESOURCES:

Food Science and You, pp274-282
Teacher's Resource Guide, pp.250-262

Food Science

Food-borne Illness Investigations, Instructor's Manual

COURSE:	Food Science	UNIT: **Food Microbiology**
COMPETENCY:	025.00 - C2	Discuss factors that cause microbial spoilage.
OBJECTIVE:	025.01 - C1	*Identify organisms that cause food spoilage. (1)*

OUTLINE	BEHAVIOR	STRATEGIES
Microorganisms and Food Spoilage	C1	List the four types of microorganisms that cause food spoilage.
Main Causes of Food Spoilage Molds Yeasts Bacteria Enzymes	C1	Identify the types of microorganisms that cause spoilage in the following foods: Meats and poultry Seafood Fruits and vegetables Dairy products Frozen meat pies Dehydrated foods Eggs Fermented foods, beer, wines Bakery products Flours Canned foods Mayonnaise
	C1	Tell how to detect food spoilage in the above food items.

RESOURCES:

Food Science and You, pp.274-276
Teacher's Resource Guide, pp.250-262

Food Science

Making Food Safe

Food-borne Illness Investigations, Instructor's Manual

Modern Food Microbiology, pp.63-95,187-234

COURSE: Food Science UNIT: **Food Microbiology**

COMPETENCY: 025.00 - C2 Discuss factors that cause microbial spoilage.

OBJECTIVE: 025.02 - C2 *Explain how the growth of microorganisms can be minimized to prevent food spoilage. (3)*

OUTLINE	BEHAVIOR	STRATEGIES
Minimizing the Growth of Microorganisms Nature of Microorganisms Characteristics Appearance Effects of Temperature Effects of Water Effects of pH Effects of Microorganisms on Food Spoilage	C2	Explain the effects of pH on bacteria food spoilage. Tell the proper pH level that minimizes or prevent food spoilage due to bacteria.
	C2	Discuss the effects of temperature on bacteria that cause food spoilage. Identify examples of foods in which high temperatures are used to destroy reduce the negative effects of harmful bacteria.
	C2	Summarize the effects of water on bacteria that cause food spoilage. Identify water levels in specific foods that minimize or prevent the growth of harmful bacteria.
	C2	Cite five examples of food spoilage due to bacteria. Tell how to minimize or prevent food spoilage in these foods.
	C2	Give examples of strategies that may be used to prevent/minimize food spoilage in foods that house more than one type of spoilage causing microorganisms.

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COURSE:	Food Science	UNIT: **Food Microbiology**
COMPETENCY:	025.00 - C2	Discuss factors that cause microbial spoilage.
OBJECTIVE:	025.02 - C2	*Explain how growth of microorganisms can be minimized to prevent food spoilage. (3)*

OUTLINE	BEHAVIOR	STRATEGIES
	C2	Explain the effects of pH on molds that cause food spoilage. Tell the proper pH level that minimizes or prevent molds causing food spoilage.
	C2	Discuss the effects of temperature on molds that cause food spoilage. Identify examples of foods in which high temperatures are used to destroy or reduce the negative effects of harmful molds.
	C2	Summarize the effects of water on molds that cause food spoilage. Identify water levels in specific foods that minimize or prevent the growth of molds.
	C2	Cite five examples of food spoilage due to molds. Tell how to minimize or prevent food spoilage in these foods.
	C2	Explain the effects of pH on yeasts that cause food spoilage. Tell the proper pH level that minimizes or prevents yeast causing food spoilage.

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COURSE:	Food Science	UNIT: **Food Microbiology**
COMPETENCY:	025.00 - C2	Discuss factors that cause microbial spoilage.
OBJECTIVE:	025.02 - C2	*Explain how growth of microorganisms can be minimized to prevent food spoilage. (3)*

OUTLINE	BEHAVIOR	STRATEGIES
	C2	Discuss the effects of temperature on yeasts that cause food spoilage. Identify examples of foods in which high temperatures are used to destroy or reduce the negative effects of harmful yeasts.
	C2	Summarize the effects of water on yeasts that cause food spoilage. Identify water levels in specific foods that minimize or prevent the growth of yeasts.
	C2	Cite five examples of food spoilage due to yeasts. Tell how to minimize or prevent food spoilage in these foods.
	C2	Explain the effects of pH on enzymes that cause food spoilage. Tell the proper pH level that minimizes or prevent enzyme causing food spoilage.

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COURSE:	Food Science	UNIT: **Food Microbiology**
COMPETENCY:	025.00 - C2	Discuss factors that cause microbial spoilage.
OBJECTIVE:	025.02 - C2	*Explain how the growth of microorganisms can be minimized to prevent food spoilage. (3)*

OUTLINE	BEHAVIOR	STRATEGIES
	C2	Discuss the effects of temperature on enzymes that cause food spoilage. Identify examples of foods in which high temperatures are used to destroy or reduce the negative effects of harmful enzymes.
	C2	Some microorganisms produce enzymes that cause food spoilage. Summarize the effects of water on enzymes that cause food spoilage. Identify water levels in specific foods that prevent the growth of enzymes.
	C2	Cite five examples of food spoilage due to enzymes. Tell how to prevent food spoilage in these foods.

RESOURCES:

Food Science and You, pp.274-276
Teacher's Resource Guide, pp.250-262

Food Science, pp.157-168

Microbial Ecology of Foods

Food-borne Illness Investigations, Instructor's Manual

Making Food Safe

A Laboratory Manual for Food Microbiology and Biotechnology

COURSE: Food Science — UNIT: **Food Microbiology**

COMPETENCY: 026.00 - C3 — Analyze principles of food safety.

OBJECTIVE: 026.01 - C3 — *Differentiate between food-borne infections, intoxications, and toxicoinfections. (2)*

OUTLINE	BEHAVIOR	STRATEGIES
Types of Food Poisoning Food Intoxication *Clostridium perfringens* *Staphylococcus aureus* *Clostridium botulinum* Food Infections *Salmonella* Animal parasite Trichinella spiralis	C1	Define the following terms: Intoxications Toxicointoxications Foodborne infections Pathogenic Parasite
	C1	List specific organisms that cause foodborne illnesses. Identify the 3 toxin-producing bacteria that can cause food intoxications.
	C2	Summarize the main properties of *Clostridium perfringens, Staphylococcus aureus,* and *Clostridium botulinum:* Source Means of transporting the bacteria Life span of the bacteria Severity of effects
	C3	Illustrate through poster/experiment why storing foods at the right temperature is critical in maintaining food safety and nutritional value.
	C2	Explain how food intoxication caused by staph bacteria can be prevented.

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COURSE:	Food Science	UNIT: **Food Microbiology**
COMPETENCY:	026.00 - C3	Analyze principles of food safety.
OBJECTIVE:	026.01 - C3	*Differentiate between food-borne infections, intoxications, and toxicoinfections. (2)*

OUTLINE	BEHAVIOR	STRATEGIES
	C3	Explain why food poisoning caused by C. *perfringens* is difficult to prevent in foods.
	C3	Differentiate between food intoxications and food infections.
	C1	List the two main organisms that cause infection-type food poisoning. Identify examples of foods most likely to contain microorganisms that cause food infections.
	C2	Explain how infectious-type microorganisms are transported in foods.

RESOURCES:

Food Science and You, pp.274-283
Teacher's Resource Guide, pp.250-262

Making Food Safe

"Food Safety and Danger Zone" (Video)
Learning Seed

"Existing and Emerging Foodborne Diseases", International Journal of Food Microbiology, 15(1992), 197-205.

"Food Poisoning" (Video)
American School Publishers

COURSE:	Food Science	UNIT: **Food Microbiology**
COMPETENCY:	026.00 - C3	Analyze principles of food safety.
OBJECTIVE:	026.02 - C3	*Compare the bacteria populations in foods. (2)*

OUTLINE	BEHAVIOR	STRATEGIES
Bacteria Populations Controlling Microorganisms in Foods Importance of Pasteurization	C3	Compare the bacteria populations in fresh and week-old samples of raw and pasteurized milk. Conduct Laboratory Experiment 17-2: Bacteria in Milk, Food Science and You, p.288.
	C3	Explain why the bacteria populations are less or greater in each sample.
	C2	Discuss the dangers of drinking raw milk.
	C1	List the names of bacteria found in raw and pasteurized milk.
	C3	Compare the bacteria populations of fresh pasteurized and spoiled milk.

RESOURCES:

Food Science and You, pp.288-289
Teacher's Resource Guide, pp.250-262

Making Food Safe

COURSE:	Food Science	UNIT: **Food Microbiology**
COMPETENCY:	026.00 - C3	Analyze principles of food safety.
OBJECTIVE:	026.03 - C3	*Differentiate between cleaning and sanitizing. (1)*

OUTLINE	BEHAVIOR	STRATEGIES
Preventing Food Poisoning	C3	Distinguish between cleaning and sanitizing.
Cleaning Cleaning agents Cleaning procedures	C3	Demonstrate acceptable methods of cleaning laboratory equipment.
Sanitizing Effect of hard/soft water Sanitizing Agents Disinfectants	C3	Explain how disinfectants are similar and/or different from sanitizers.
	C1	Cite an example when cleaning is appropriate and when sanitizing is appropriate.
	C3	Demonstrate acceptable methods of sanitizing laboratory equipment.
	C1	Identify appropriate sanitizing agents used for sanitation.
	C3	Research the effects of hard and soft water on the effectiveness of sanitizing agents.

RESOURCES:

Food Science and You, pp.282-289
Teacher's Resource Guide, pp.250-262

Microbial Ecology of Foods
Vol.1, 'Factors Affecting
Life and Death'.

Food-borne Illness Investigations,
Instructor's Manual

COURSE:	Food Science	UNIT: **Food Microbiology**
COMPETENCY:	026.00 - C3	Analyze principles of food safety.
OBJECTIVE:	026.04 - C3	*Examine safe food handling practices.(3)*

OUTLINE	BEHAVIOR	STRATEGIES
Safe Food Handling Practices	C2	Make a list of acceptable food handling practices. Discuss the benefits to each practice.
Acceptable Practices Treating Work Surfaces Handling Foods Safely HACCP System	C2	Explain how to treat wooden and plastic surface areas used to cut meats and poultry.
	C3	Determine the presence of bacteria on unwashed surfaces. Conduct Laboratory Experiment 17-1: Growing Cultures, Food Science and You, pp.286-287.
	C2	Outline a menu for a picnic. Describe how each food should be handled to prevent food poisoning.
	C1	Describe safe food handling practices at public buffets that prevent food poisoning.
	C3	Research the Hazard Analysis Critical Control Point (HACCP) system. Explain the function of the system. Describe the system. Identify various principles/endorsements supported by this system. List some limitations of the HACCP system.[1]

(CONTINUED)

COURSE: Food Science — UNIT: **Food Microbiology**

COMPETENCY: 026.00 - C3 — Analyze principles of food safety.

OBJECTIVE: 026.04 - C3 — *Examine safe food handling practices.(3)*

OUTLINE	BEHAVIOR	STRATEGIES
	C3	Develop a list of basic food safety guidelines that should be used to educate all consumers.
	C3	As an FHA chapter activity, plan and implement a seminar for high school and/or senior citizens focusing on food safety practices. Use the FHA planning process to organize and implement the seminar.
	C2	Discuss the role of food labeling as it affects food safety.

RESOURCES:

Food Science and You, pp.281-283
Teacher's Resource Guide, pp.250-262

'Modern Food Microbiology, pp.434-452

"HACCP and the Home: The Need for Consumer Education" Food Technology, 46(June 1991)123-124.

Food-borne Illness Investigations, INstructor's Manual

"Professional Ethics and Food Safety" Food Technology, 45(1991) 124-129.

"The Politics of Food", Food Technology, 46(1992) 58-63.

COURSE:	Food Science	UNIT: **Food Microbiology**
COMPETENCY:	026.00 - C3	Analyze principles of food safety.
OBJECTIVE:	026.05 - C1	*Describe the role of federal, state, and local agencies in regulating food safety standards. (2)*

OUTLINE	BEHAVIOR	STRATEGIES
Safety Standards	C1	Identify United States and international agencies that keep the food supply safe.
Legislation Federal State Local	C1	List at least 8 sources of information regarding food safety standards.
Food Processing United States - FDA International Agencies - FAO and WHO	C1	Cite 5 examples each of federal, state, and local food safety standards.
Food Labeling Wiley Food & Drug Act of 1906 Drug & Cosmetic Act of 1938 Sodium Labeling, July 1986	C1	Write to food safety regulating agencies for policy information regarding any aspect of food safety (irradiation, meat inspection, food grading standards, biotechnology policies, artificial sweeteners, labeling practices). Prepare and present a speech to the class regarding your findings.[1]
	C1	Describe information required on food labels.
	C1	Describe what the government is doing to communicate information about food safety to consumers.[2]

(CONTINUED)

COURSE:	Food Science	UNIT: **Food Microbiology**
COMPETENCY:	026.00 - C3	Analyze principles of food safety.
OBJECTIVE:	026.05 - C1	*Describe the role of federal, state, and local agencies in regulating food safety standards. (2)*

OUTLINE	BEHAVIOR	STRATEGIES
	C1	State the role of the U.S. Department of Agriculture regarding food safety and inspection services.

RESOURCES:

Food Science and You, pp.283-289
Teacher's Resource Guide, pp.250-262

"Ethics and Food Safety"
Food Technology, 45(1991) 124-129.

[1]Food Technology - All volumes
Consult the 'Washington News" reports for updates on standards, policies, etc.

Food-borne Illness Investigations, Instructor's Manual

[2]"Government's Role in "Professional Communicating Food Safety Information to the Public",
Food Technology, 45(May 1991)

"What's in the Food" (Filmstrip)
"Understanding Food Labels (Software)
Learning Seed

COURSE: Food Science UNIT: **Food Microbiology**

COMPETENCY: 027.00 - C3 Explore the role of fermentation in food science.

OBJECTIVE: 027.01 - C1 *Describe mold, yeast, and bacterial fermentations. (2)*

OUTLINE	BEHAVIOR	STRATEGIES
Fermentation Bacteria Fermentation Lactic acid bacteria Acetic acid bacteria Carbon dioxide	C1	Define the following terms: Fermentation Cell Respiration Indigenous microorganisms Anaerobic Anaerobic respiration
Yeast Yeast breads Beverages Mold & Enzyme Fermentation	C1	Identify 3 reasons for fermenting foods. Describe the effects of fermentation on the body.
	C1	Describe the relationship between fermentation and microorganisms.
	C1	List foods in which lactic acid bacteria is used in the production of the food item (i.e. sour cream, cheddar cheese, olives, dill pickles, sauerkraut, vanilla extract).
	C1	Define the equation that represents the lactic acid bacteria reaction in the fermentation process.
	C1	Describe the reaction of acetic acid bacteria in fermentation. Identify food items produced through the use of acetic acid bacteria in the fermentation process.

(CONTINUED)

COURSE:	Food Science	UNIT: **Food Microbiology**
COMPETENCY:	027.00 - C3	Explore the role of fermentation in food science.
OBJECTIVE:	027.01 - C1	*Describe mold, yeast, and bacterial fermentations. (2)*

OUTLINE	BEHAVIOR	STRATEGIES
	C1	Describe the reaction of carbon dioxide in the fermentation process. List examples of foods produced through this process.
	C1	List food items produced through a combination of microorganisms.
	C1	Describe the reaction that occurs in yeast fermentation. Describe the purpose of each ingredient used to make yeast breads.
	C1	List beverages that are the result of yeast fermentation.
	C1	Tell the role of mold fermentation in food digestion.
	C1	Describe the role of enzymes in mold fermentation and yeast fermentation.
	C1	List foods produced from mold and enzyme fermentation.

(CONTINUED)

COURSE:	Food Science	UNIT: **Food Microbiology**
COMPETENCY:	027.00 - C3	Explore the role of fermentation in food science.
OBJECTIVE:	027.01 - C1	*Describe mold, yeast, and bacterial fermentations. (2)*

OUTLINE	BEHAVIOR	STRATEGIES
	C1	Describe the nutritional characteristics of fermented foods.
	C1	Write a paragraph explaining the process of fermentation.

RESOURCES:

Food Science and You, pp.238-250
Teacher's Resource Guide, pp.223-236

Food Science, pp.328-347

Food-borne Illness Investigations, Instructor's Manual

Modern Food Microbiology, pp.371-409, 'Fermented Foods and Related Products of Fermentation'.

COURSE:	Food Science	UNIT: **Food Microbiology**
COMPETENCY:	027.00 - C3	Explore the role of fermentation in food science.
OBJECTIVE:	027.02 - C3	*Explore how various factors affect fermentations. (3)*

OUTLINE	BEHAVIOR	STRATEGIES
Factors That Affect Fermentations Environmental Factors Temperature Oxygen Salt pH Sugar Other recipe ingredients	C3	Determine environments which provide optimum conditions for yeast growth. Conduct Laboratory Experiment 15-2: Yeast Growth, Food Science and You, p.252.
	C3	Determine the effects of excessive sugar, salt, and/or eggs in yeast breads. Repeat Experiment 15-2 with temperature as the variable (possible temperatures include 30°C, 35°C, 50°C, and 70°C).
	C2	Discuss the effects of a low pH level on the fermentation of pickles. Describe the results when the pH is lower than 3.5 and higher than 4.5.
	C2	Explain how factors such as temperature, salt, and oxygen affect bacteria, yeast, mold, and enzyme fermentations.

RESOURCES:

Food Science and You, pp.241-253
Teacher's Resource Guide, pp.223-256

Food Science

Food-borne Illness Investigations, Instructor's Manual

Microbial Ecology of Foods

COURSE: Food Science UNIT: **Food Microbiology**

COMPETENCY: 027.00 - C3 Explore the role of fermentation in food science.

OBJECTIVE: 027.03 - C3 *Explain why fermentations preserve foods. (2)*

OUTLINE	BEHAVIOR	STRATEGIES
Fermentation as a Preservative Technique	C3	Prepare pickles and monitor their fermentation. Observe changes in pH, color, texture, and appearance. Laboratory Experiment 15-A: Fermentation of Pickles, Teacher's Resource Guide, p.225, 234.
	C1	Write a description of the fermentation process as it occurs at various stages in Laboratory Experiment 15-A.
	C3	Prepare sauerkraut and monitor it during fermentation. Observe changes in pH, color, texture, and appearance. Conduct Laboratory Experiment 15-1: Lactic Acid Fermentation, Food Science and You, p.251.
	C1	Write a description of the fermentation process as it occurs in making sauerkraut.
	C3	Identify the microorganisms used to produce sauerkraut and pickles. Recognize the equation of the reaction that occurs in each fermentation process.

(CONTINUED)

COURSE:	Food Science	UNIT: **Food Microbiology**
COMPETENCY:	027.00 - C3	Explore the role of fermentation in food science.
OBJECTIVE:	027.03 - C3	*Explain why fermentations preserve foods. (2)*

OUTLINE	BEHAVIOR	STRATEGIES
	C2	Summarize the characteristics of the fermentation process that preserves foods.
	C1	Tell how long various fermented foods may be kept and viable for consumption.
	C3	Develop a list of basic guidelines consumers should know before attempting to ferment foods.

RESOURCES:

Food Science and You, pp.245-253
Teacher's Resource Guide, pp.223-256

Food Science

Microbial Ecology of Foods

Food-borne Illness Investigations, Instructor's Manual

Making Food Safe

COURSE:	Food Science	UNIT: **Food Preservation**
COMPETENCY:	028.00 - C3	Determine the value of dehydration as a method of food preservation.
OBJECTIVE:	028.01 - C1	*Identify the purposes of dehydration.(1)*

OUTLINE	BEHAVIOR	STRATEGIES
Dehydration Purposes of Dehydration Preserve food Decrease weight and bulk	C1	Define the following terms: Caseharden Dehydration Dehydrofreezing Reconstitution Rehydration Steam blanching Sulfiting Sulfuring Syrup blanching
	C1	List 3 reasons for drying food.
	C1	Describe the benefits of dehydrating meat, fish, fruits, and vegetables.
	C1	Make a list of foods that are easier to prepare because they have been dehydrated.
	C1	Tell how dehydration has been used in ancient times to preserve foods.
	C1	Explain why dehydrated foods are increasing in popularity.

(CONTINUED)

COURSE:	Food Science	UNIT: **Food Preservation**
COMPETENCY:	028.00 - C3	Determine the value of dehydration as method of food preservation.
OBJECTIVE:	028.01 - C1	*Identify the purposes of dehydration.(1)*

OUTLINE	BEHAVIOR	STRATEGIES
	C1	Tell whether or not the nutritional value of foods change during the dehydration process. Decide if some nutrients survive this process better than others. Does dehydration affect the caloric value of foods.

RESOURCES:

Food Science and You, pp.290-291
Teacher's Resource Guide, pp.263-276

Food Science

COURSE: Food Science UNIT: **Food Preservation**

COMPETENCY: 028.00 - C3 Determine the value of dehydration as method of food preservation.

OBJECTIVE: 028.02 - C2 *Explain the dehydration process.(5)*

OUTLINE	BEHAVIOR	STRATEGIES
Dehydration Process	C2	Explain why foods are sliced thin in preparation for drying.
Preparation for Dehydration Physical condition of food Sulfiting Sulfuring Blanching	C2	Discuss methods used to pretreat foods for drying. Cite advantages of Pretreating. Identify foods that do not require pretreating.
Methods of Dehydration Sun drying Dehydrators Room and oven drying	C2	Explain the effects of enzymes and and sugar on drying fruits.
Dehydrofreezing	C2	Describe 3 methods of preventing browning in fruits and light-colored vegetables. Tell the advantages and disadvantages of sulfiting, sulfuring, and blanching. Explain how sodium bisulfite may affect the body.
	C2	Summarize the advantages and disadvantages of using sun drying, dehydrators, room and oven drying, and dehydrofreezing as methods of drying foods. Consider the following factors: cost time temperature quality flavor pretreating color

(CONTINUED)

COURSE:	Food Science	UNIT: **Food Preservation**
COMPETENCY:	028.00 - C3	Determine the value of dehydration as method of food preservation.
OBJECTIVE:	028.02 - C2	*Explain the dehydration process.(5)*

OUTLINE	BEHAVIOR	STRATEGIES
	C2	Discuss why air temperature and movement play an important role in successful dehydration.
	C2	Summarize the results of Laboratory Experiment 18-1: Dehydrating Fruits and Vegetables, Food Science and You, pp.300-301. Determine the loss of water that occurs by calculating the loss of mass.
	C2	Conduct Laboratory Experiment 18-A: Making Raisins, Teacher's Resource Guide, p.266. Compare the taste, color, and mouthfeel of laboratory dehydrated raisins and those purchased from grocery stores.
	C1	Identify another name for rehydration. Describe the process of rehydrating fruits and vegetables.

RESOURCES:

Food Science and You, pp.292-303
Teacher's Resource Guide, pp.263-276

Food Science

COURSE:	Food Science	UNIT: **Food Preservation**
COMPETENCY:	028.00 - C3	Determine the value of dehydration as method of food preservation.
OBJECTIVE:	028.03 - C3	*Explore the role of sublimation in freeze-drying. (2)*

OUTLINE	BEHAVIOR	STRATEGIES
Freeze-Drying/Lyophilization Sublimation Flash frozen Conditions	C1	Define the following terms: Sublimation Freeze-drying Flash frozen
Use and Storage	C1	Identify examples of foods that can be freeze-dried. Tell how these foods should be stored.
	C2	Explain why freeze-dried foods can only be produced commercially.
	C3	Research the shelf life of freeze-dried foods. Determine the effects of packaging on the shelf life. Illustrate through display, the various acceptable packages for freeze-dried foods.
	C3	Conduct a laboratory experiment in which freeze-dried ingredients are used. Compare the results of a recipe prepared with freeze-dried and fresh ingredients for mouthfeel, flavor, appearance, and cost.
	C3	Listen to a guest speaker who freeze-dries food. Describe the process of freeze-drying.

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COURSE:	Food Science	UNIT: **Food Preservation**
COMPETENCY:	028.00 - C3	Determine the value of dehydration as method of food preservation.
OBJECTIVE:	028.03 - C3	*Explore the role of sublimation in freeze-drying. (2)*

OUTLINE	BEHAVIOR	STRATEGIES
	C2	Discuss the role of water in the freeze-drying process.
	C2	Explain the process of sublimation as it affects freeze-drying foods.

RESOURCES:

Food Science and You, pp.322-323
Teacher's Resource Guide, pp.289-301

Food Science

COURSE:	Food Science	UNIT: **Food Preservation**
COMPETENCY:	029.00 - C3	Evaluate freezing as a method of preservation.
OBJECTIVE:	029.01 - C2	*Discuss the role of blanching in freezing vegetables.(1)*

OUTLINE	BEHAVIOR	STRATEGIES
Freezing Foods Selecting Food For Freezing Commercial Freezing Indirect-contact freezing Immersion freezing Best Freezing Conditions	C1	Define the following terms: Freezing Blanching Commercial freezing Immersion freezing Indirect-contact freezing Refrigerant
	C2	Examine the factors needed for the successful freezing of food.
	C2	Explain how freezing functions as a method of preserving foods. Discuss the relationship between freezing, microorganisms, and enzyme reactions.
	C1	Identify foods most appropriate for freezing.
	C2	Explain the effects of commercial freezing on color, texture, and flavor of foods.
	C1	Describe the 3 basic methods used in commercial freezing. What factors affect food quality when each method is used.

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COURSE:	Food Science	UNIT: **Food Preservation**
COMPETENCY:	029.00 - C3	Evaluate freezing as a method of preservation.
OBJECTIVE:	029.01 - C2	*Discuss the role of blanching in freezing vegetables.(1)*

OUTLINE	BEHAVIOR	STRATEGIES
	C2	Tell whether or not freezing affects the nutritional value of foods.
	C2	Describe the blanching process. Explain how not blanching prior to freezing affects the quality of foods.

RESOURCES:

Food Science and You, pp.319-322
Teacher's Resource Guide, pp.289-301

Food Science

COURSE: Food Science UNIT: **Food Preservation**

COMPETENCY: 029.00 - C3 Evaluate freezing as a method of preservation.

OBJECTIVE: 029.02 - C3 *Explore the factors that affect the storage of frozen foods.(3)*

OUTLINE	BEHAVIOR	STRATEGIES
Storage of Frozen Foods Temperature Packaging	C3	Research the packaging most appropriate for frozen foods. Investigate regulations that affect the packaging of frozen foods.
	C2	Develop a list of characteristics desirable of containers appropriate for frozen foods. — puncture resistant — good quality to prevent contamination and minimize dehydration — resistant to low temperatures — no odor — non-stick finish — ease in identification — rotation symbols and lot numbers
	C2	Explain how packaging affects the quality of frozen foods.
	C1	Identify temperatures appropriate for storing frozen foods.

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COURSE:	Food Science	UNIT: **Food Preservation**
COMPETENCY:	029.00 - C3	Evaluate freezing as a method of preservation.
OBJECTIVE:	029.02 - C3	*Explore the factors that affect the storage of frozen foods.(3)*

OUTLINE	BEHAVIOR	STRATEGIES
	C3	Compare samples of fresh, frozen, freeze-dried, aseptically-processed, and pouch-canned orange juice. Examine the samples for color, mouthfeel, taste, and cost. Conduct Laboratory Experiment 20-2: Comparison of Orange Juice, Food Science and You, p.332.
	C1	Identify the freezing-point of various foods.
	C2	Discuss the storage life of various foods. Identify factors that affect the storage life.
	C3	Conduct a laboratory experiment in which various foods are prepared for freezing, are frozen, and stored at the proper temperatures. Use 'length of blanching time' as the variable. Compare the appearance, taste, texture, and overall quality of food (similar to Experiment 12-2. Food Science and You, p.208.

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COURSE:	Food Science	UNIT: **Food Preservation**
COMPETENCY:	029.00 - C3	Evaluate freezing as a method of preservation.
OBJECTIVE:	029.02 - C3	*Explore the factors that affect the storage of frozen foods.(3)*

OUTLINE	BEHAVIOR	STRATEGIES
	C3	The trade organizations listed below form a coalition known as the Frozen Food Roundtable. They work together to establish the *Code of Recommended Practices* for handling and merchandising frozen foods. Write to one of the organizations below for information regarding the handling and merchandising of frozen foods. Share your findings with the class. Refer to Resources for addresses. American Asso. of Meat Processors American Frozen Food Institute Commercial Refrigerator Manufacturers Association Food Marketing Institute Frozen Potato Products Institute Interstate Carriers Conference National Frozen Food Association National Frozen Brokers Association National Frozen Pizza Institute National Grocers Association National Restaurant Association National Prepared Frozen Food Asso.

(CONTINUED)

COURSE:	Food Science	UNIT: **Food Preservation**
COMPETENCY:	029.00 - C3	Evaluate freezing as a method of preservation.
OBJECTIVE:	029.02 - C3	*Explore the factors that affect the storage of frozen foods.(3)*

OUTLINE	BEHAVIOR	STRATEGIES
	C1	Identify technological advancement in frozen food processing, storage, and distribution that have enhanced the frozen food product.

RESOURCES:

Food Science and You, pp.320-322, 332-333
Teacher's Resource Guide, pp.263-276

Food Science, pp.215-245

COURSE:	Food Science	UNIT: **Food Preservation**
COMPETENCY:	030.00 - C3	Evaluate canning as a preservation method.
OBJECTIVE:	030.01 - C2	*Explain the two methods of processing home-canned foods.(2)*

OUTLINE	BEHAVIOR	STRATEGIES
Canning	C2	Summarize the history of canning.
Home Canning Equipment Packaging	C1	Identify equipment used in home and commercial canning.
Raw pack Cold pack Hot pack Processing Methods Water-bath processing Pressure processing	C2	Explain the effects of acid levels in foods on canning methods. List examples of low acid and high acid foods. Recognize which method is most appropriate for low acid and high acid foods.
	C1	Recognize the temperatures needed to kill bacteria in high acid and low acid foods.
	C3	Research the shelf-life of various low and high acid foods.
	C3	Identify the 2 methods of processing home-canned foods. Compare and contrast the 2 methods. List the steps of the water-bath process of canning. List the steps of the pressure process of canning.
	C3	Make general statements about the nutritional value of canned foods versus fresh foods.

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COURSE:	Food Science	UNIT: **Food Preservation**
COMPETENCY:	030.00 - C3	Evaluate canning as a preservation method.
OBJECTIVE:	030.01 - C2	*Explain the two methods of processing home-canned foods.(2)*

OUTLINE	BEHAVIOR	STRATEGIES
	C1	Identify the canning process most appropriate for low acid and high acid foods.

RESOURCES:

Food Science and You, pp.304-310
Teacher's Resource Guide, pp.277-288

Food Science, pp.215-245

COURSE:	Food Science	UNIT: **Food Preservation**
COMPETENCY:	030.00 - C3	Evaluate canning as a preservation method.
OBJECTIVE:	030.02 - C3	*Compare regular canning and aseptic canning.(3)*

OUTLINE	BEHAVIOR	STRATEGIES
Types of Canning	C2	Summarize the history of commercial canning.
Commercial Canning Retort canning Aseptic canning Heat transfer	C3	Compare and contrast regular retort and aseptic canning.
Botulism Poisoning Avoiding botulism Detecting botulism	C3	Compare heat transfer by conduction and by convection in canning.
	C3	Research the properties of C. botulinum that make botulism poisoning a problem in improperly canned foods.
	C1	Identify signs of botulism in canned foods.
	C3	Develop a list of foods that have been aseptically packaged.
	C3	Observe factors that promote or retard the growth of bacteria in food. Conduct Laboratory Experiment 19-1: Environment and Food Preservation, Food Science and You, p.315.

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COURSE:	Food Science	UNIT: **Food Preservation**
COMPETENCY:	030.00 - C3	Evaluate canning as a preservation method.
OBJECTIVE:	030.02 - C3	*Compare regular canning and aseptic canning.(3)*

OUTLINE	BEHAVIOR	STRATEGIES
	C3	Evaluate canned peas by looking for evidence that the sugar found in young peas has turned to the starch found in older peas. Conduct Laboratory Experiment 19-2: Evaluating Canned Peas, Food Science and You, pp.316-317.
	C3	Determine the cost of canning a food item versus purchasing the item from the store.
	C3	View a film/video on the canning process. Prepare a bulletin board or poster that illustrates proper canning procedures.
	C3	As an FHA activity, design, prepare, and distribute flyers describing proper canning procedures.

RESOURCES:

Food Science and You, pp.310-315
Teacher's Resource Guide, pp.277-288
Food Science, pp.215-245

COMPETENCY:	031.00 - C3	Evaluate irradiation as a method of food preservation.
OBJECTIVE:	031.01 - C1	*Describe the process of food irradiation and its effects on food. (2)*

OUTLINE	BEHAVIOR	STRATEGIES
Irradiation Amounts of Radiation Radiation Absorbed Dose (rad) Gray (Equal to 100 rads) Krad (1000 rads)	C1	Define the following terms: Gamma Rays Beta Rays Irradiation Radiation Absorbed Dose (rad) Gray Krad
Packaging for Irradiated Foods	C1	Describe the procedure of irradiating foods. Tell the effects of irradiation on the flavor, odor, color, and nutritional value of low dose and high dose irradiation.
	C1	Tell why irradiation is referred to as cold food preservation.
	C1	Identify at least 3 advantages and disadvantages of irradiation as a preservation method. Describe the benefits and risks of food irradiation.
	C1	Describe the relationship between irradiation and microorganisms that cause food spoilage (i.e. C. botulinum).

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COURSE:	Food Science	UNIT: **Food Preservation**
COMPETENCY:	031.00 - C3	Evaluate irradiation as a method of food preservation.
OBJECTIVE:	031.01 - C1	*Describe the process of food irradiation and its effects on food. (2)*

OUTLINE	BEHAVIOR	STRATEGIES
	C1	List 4 uses of irradiation in foods (preservation, in the pasteurization of milk, sprout inhibition of white potatoes, insect disinfectant of wheat flour, control insects and microorganisms in spices and other seasonings, elimination of trichinosis in fresh pork).
	C1	Select from a display, the symbol which indicates irradiated foods.
	C1	List examples of foods that have been irradiated and placed on the market for consumption.
	C1	Identify the types of rays used in irradiation. Tell the impact of the rays on microorganisms that cause food spoilage.
	C1	Highlight the irradiation process used for strawberries recently introduced in the United States market.[1]

(CONTINUED)

COURSE:	Food Science	UNIT: **Food Preservation**
COMPETENCY:	031.00 - C3	Evaluate irradiation as a method of food preservation.
OBJECTIVE:	031.01 - C1	*Describe the process of food irradiation and its effects on food. (2)*

OUTLINE	BEHAVIOR	STRATEGIES

RESOURCES:

Food Science and You, pp.324-329
Teacher's Resource Guide, pp.289-301

Food Science, pp.303-327

Facts About Food Irradiation"
International Consultation Group on Food Irradiation

"Irradiated Strawberries Enter the U.S. Market", Food Technology, 46(May 1992) 80-82.

COURSE:	Food Science	UNIT: **Food Preservation**
COMPETENCY:	031.00 - C3	Evaluate iradiation as a method of food preservation.
OBJECTIVE:	031.02 - C3	*Investigate the effect the Delaney clause has had on the irradiated food industry.(2)*

OUTLINE	BEHAVIOR	STRATEGIES
Irradiation in the Food Industry Regulations of Irradiation By FDA Delaney Anti-Cancer Clause	C2	Explain why food irradiation is one of the most controversial methods of food preservation used today. Discuss consumer concerns regarding irradiated foods.
	C3	Irradiation is controlled by the FDA in the U.S. Research the Food and Drug Administration's (FDA) approval of irradiated foods in 1986. Explain why the technique was approved, examples, of testing conducted, consumer, concerns, and approved levels of irradiation.[1]
	C3	Distinguish between low, medium, and high, levels of radiation doses as defined by the FDA (100 kiolorads/low, 100-1000/medium, over 1000/high).
	C2	Summarize factors of cost, practicality, and consumer concerns as they affect the implementation of food irradiation.
	C1	Write to government and private organizations for information on irradiation (see resource list).

(CONTINUED)

COURSE:	Food Science	UNIT: **Food Preservation**
COMPETENCY:	031.00 - C3	Evaluate irradiation as a method of food preservation
OBJECTIVE:	031.02 - C3	*Investigate the effect the Delaney clause has had on the irradiated food industry.(2)*

OUTLINE	BEHAVIOR	STRATEGIES
	C3	Develop several survey questions on food irradiation based on your research findings. Discover what your community members think about food irradiation. Interview 3-4 persons in your school/neighborhood about their belief and knowledge of food irradiation.[2]
	C1	Identify restaurants in your area who use irradiated foods.
	C3	As an FHA activity, plan and implement a seminar at a school meeting, educating consumers about irradiated foods. Visuals are essential to a good presentation. Use the FHA planning process.
	C3	Research and explain the relationship between the Delaney Anti-Cancer Clause and irradiation. Explain why the FDA approves food for irradiation on a one-by-one basis.

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COURSE: Food Science UNIT: **Food Preservation**

COMPETENCY: 031.00 - C3 Evaluate irradiation as a method of food preservation.

OBJECTIVE: 031.02 - C3 *Investigate the effect the Delaney clause has had on the irradiated food industry.(2)*

OUTLINE	BEHAVIOR	STRATEGIES
	C1	Describe the characteristics of packaging appropriate for irradiated foods.
	C2	Explain how packaging for irradiated food is similar and/or different than packaging for frozen, canned, and fresh foods.

RESOURCES:

Food Science and You, pp.326-327
Teacher's Resource Guide, pp.289-301

[1]Penn State Nutrition Science Activities "What Do People Think About Food Irradiation", Penn State Nutrition Center

Food Science, pp.215-245

[2]"What Do Consumers Think About Irradiated Foods", Food Safety Review, Fall 1992.

"Irradiated Produce Reaches Midwest Market", Food Technology, 46(May 1992), 89-92.

COURSE:	Food Science	UNIT: **Food Preservation**
COMPETENCY:	032.00 - C2	Explain the role of preservatives.
OBJECTIVE:	032.01 - C1	*Identify examples of preservatives.(1)*

OUTLINE	BEHAVIOR	STRATEGIES
Preservatives	C1	Define preservative.
Definition of Preservative Use of Preservatives	C1	Recognize the ultimate goal of using preservatives.
	C1	List examples of preservatives found in common foods. Describe the purpose of each preservative in the food (i.e. soft drinks, acidic foods, breads and cakes, cheese, spices, dried fruits).
	C1	Identify examples of foods that do not have preservatives.
	C1	Tell the difference between natural and chemical preservatives.
	C1	Point out the similarities and differences between preservatives and additives.
	C1	Identify examples of preservatives that control browning of fruits and vegetables caused by enzymes (i.e. sulfur dioxide).

RESOURCES:

Food Science and You, pp.337

Food Science, pp.638-639, 651

COURSE:	Food Science	UNIT: **Food Preservation**
COMPETENCY:	032.00 - C2	Explain the role of preservatives.
OBJECTIVE:	032.02 - C2	*Discuss the role of chemical preservatives in preventing food spoilage. (2)*

OUTLINE	BEHAVIOR	STRATEGIES
Chemical Preservatives	C1	List examples of chemical preservatives.
Identification of Chemical Preservatives Preventing Food Spoilage	C2	Discuss the effects of preservatives on the quality of foods (i.e. taste, appearance, etc.).
	C2	Summarize how preservatives extend the shelf-life of foods.
	C2	Tell which governmental agency controls the regulation of preservatives. Explain governmental laws and regulations related to preservatives.
	C2	Summarize the results of wrapping a piece of fresh homemade bread (no chemical preservatives added) and a piece of fresh store-purchased bread in separate moist polyethylene sandwich bags. Note the rate at which mold forms on each piece of bread.

RESOURCES:

Food Science, pp. 638-634, 651

COURSE:	Food Science	UNIT: **Complex Food Systems**
COMPETENCY:	033.00 - C3	Explore a complex food system.
OBJECTIVE:	033.01 - C3	*Examine the various components of a complex food system.(2)*

OUTLINE	BEHAVIOR	STRATEGIES
Composition of Milk	C1	Define complex food systems.
Milk Components Protein Casein Whey	C1	Identify examples of complex food items (i.e. milk, grains, wheat, corn, rice, soy, etc.)
Enzymes Fat Sugar Minerals and vitamins Types of milk Fresh milk Cream Evaporated milk Condensed milk		There are a variety of complex food items. This unit examines cow's milk as a complex food item. Alternate the unit with others items from year to year or within small study groups. Use the complex foods unit to synthesize the concepts presented throughout the course.
Dried milk Fermented milk	C1	Define terms in 'Terms to Remember' p.254, Food Science and You.
	C2	Explain how each component of milk is dispersed in the milk.
	C1	Identify at least 10 of the 250 chemical compounds found in milk.
	C1	Describe what happens when milk protein is coagulated.
	C2	Explain the complex nature of milk as a solution, colloidal dispersion, and an emulsion.

(CONTINUED)

COURSE:	Food Science	UNIT: **Complex Food Systems**
COMPETENCY:	033.00 - C3	Explore a complex food system.
OBJECTIVE:	033.01 - C3	*Examine the various components of a complex food system.(2)*

OUTLINE	BEHAVIOR	STRATEGIES
	C2	Explain lactose intolerance. Explain why it occurs. Identify methods to minimize, alleviate, or prevent the symptoms.
	C2	Summarize the role of fat in milk products.
	C2	Explain the function of minerals in milk.
	C2	Discuss the importance of milk in the daily diet.

RESOURCES:

Food Science and You, pp. 254-258
Teacher's Resource Guide, pp.237-249

Penn State Nutrition Science Activity "The Effects of Switching to Low-fat Milk", Penn State Nutrition Center

Food Science, pp.348-389

COURSE:	Food Science	UNIT: **Complex Food Systems**
COMPETENCY:	033.00 - C3	Explore a complex food system.
OBJECTIVE:	033.02 - C2	*Discuss how the components affect food preparation.(3)*

OUTLINE	BEHAVIOR	STRATEGIES
Milk Processing Pasteurization Kills bacteria Denatures enzymes UHT Milk Homogenized Reduces size of fat particles Fortification Vitamin D	C2	Discuss the processing of milk and how it is treated when it is pasteurized, homogenized, and fortified.
	C2	Explain how pasteurization affects enzymes in milk.
	C2	Summarize the advantages and disadvantages of various types of of milk products.
	C1	Identify factors that affect the ability of cream to foam.
	C2	Explain changes that occur when milk is heated.
	C1	Define UHT milk. Discuss the advantages of UHT milk.
	C1	Describe the proper storage of milk. Tell the effects of light and heat on the nutritional value and shelf life of milk.
	C2	Summarize a film/video that illustrates techniques used to process milk. Tell the purpose of each step.

(CONTINUED)

COURSE:	Food Science	UNIT: **Complex Food Systems**
COMPETENCY:	033.00 - C3	Explore a complex food system.
OBJECTIVE:	033.02 - C2	*Discuss how the components affect food preparation.(3)*

OUTLINE	BEHAVIOR	STRATEGIES
	C2	Summarize the effects of freezing on milk and milk products. Freeze whole milk and reconstructed nonfat dry milk. Thaw after a few days. Do not agitate the milk. Observe a separation of solids and liquids. Explain what accounts for the separation. Identify the solids and liquids. Compare the appearance of the two samples before shaking them and after. Compare the two samples for consistency and taste.
	C2	Explain the effects of heat on milk. Heat a pan of whole milk. Tell why the scum forms. Observe the milk curdle as the temperature is raised. Discuss the implications for preparing product which contain milk (i.e. soups, sauces, and puddings).

RESOURCES:

Food Science and You, pp. 259-264
Teacher's Resource Guide, pp.237-249

Functions of Fermented Milk

Food Science, pp.348-389

COURSE:	Food Science	UNIT: **Complex Food Systems**
COMPETENCY:	034.00 - C3	Examine by-products of complex foods.
OBJECTIVE:	034.01 - C1	*Identify by-products of complex foods.(1)*

OUTLINE	BEHAVIOR	STRATEGIES
Milk By-Products	C1	Define by-products.
Identification of Milk Products	C1	Identify examples of milk by-products. Describe the use of milk and milk by-products.
	C1	Describe the similarities and differences between skim milk, low-fat milk, whole, milk, half-and-half, and various creams.
	C1	Cite 4 examples of fermented milk products.
	C1	Identify the 3 milk by-products created through heat (evaporated, condensed, and dried milk).

RESOURCES:

Food Science and You, pp.265-271
Teacher's Resource Guide, pp.237-249

Food Science, pp.248-389

Functions of Fermented Milk

COURSE: Food Science UNIT: **Complex Food Systems**

COMPETENCY: 034.00 - C3 Examine by-products of complex foods.

OBJECTIVE: 034.02 - C3 *Analyze the process used to create by-products from a complex food.(4)*

OUTLINE	BEHAVIOR	STRATEGIES
Creating Milk By-products Fermented Milk Products Making Fermented Milk By-products Culture	C3	Prepare yogurt using three yogurt bases. Compare the color, texture, taste, aftertaste, and pH of the final products. Food Science and You, pp.268-269.
Inoculation Incubation period Types of cultured milk By-products Buttermilk Yogurt	C3	Use your knowledge of sensory evaluation to evaluate commercial yogurt for color, taste, and texture. Compare the homemade and commercial yogurt.
Cream cheese Other cheeses Sour cream	C3	Distinguish between soft, semisoft, hard, and very hard cheeses. Cite examples of each. Explain the effects of temperature, microorganisms, enzymes, humidity, and time on the production of cheese.
	C3	Research the process involved in making fermented or cultured milk by-products.
	C2	Explain the role of water in making cheese and other milk by-products.
	C3	Research the process of making cottage cheese.

(CONTINUED)

COURSE:	Food Science	UNIT: **Complex Food Systems**
COMPETENCY:	034.00 - C3	Examine by-products of complex foods.
OBJECTIVE:	034.02 - C3	*Analyze the process used to create by-products from a complex food.(4)*

OUTLINE	BEHAVIOR	STRATEGIES
	C3	Determine the percent of milk fat found in the following products and milk by-products: whole milk lowfat milk skim milk buttermilk non-fat dry milk evaporated milk half-and-half chocolate milk sweetened condensed milk heavy whipping cream yogurt butter Cream sour cream
	C3	Plan a daily meal plan for 3 days, including milk by-products, for an individual required to lower cholesterol levels and still meet the Recommended Dietary Allowances (RDA) requirements.

RESOURCES:

Food Science, pp.248-389

Functions of Fermented Milk

COURSE:	Food Science	UNIT: **Trends in Food Science**
COMPETENCY:	035.00 - C3	Investigate emerging trends in food science.
OBJECTIVE:	035.01 - C3	*Explore emerging careers in food science and biotechnology.(3)*

OUTLINE	BEHAVIOR	STRATEGIES
Emerging Careers	C1	Define biotechnology.
Career Areas Food science Food processing Biotechnology	C1	Identify 8 emerging careers in food science and biotechnology that are developing to meet consumer trends.
Marketing Identification of Career Options Evaluation of Career Options	C3	Research 3 of the emerging careers that are the most appealing. Identify the education, training, personal qualities, job description, geographic locations of employment, computer skills required, and salary needed to be successful in the 3 career areas. Present your findings to the class.
	C3	Taste and appearance will continue to be primary concern. Identify and research careers in sensory evaluation.
	C3	Legislation on packaging waste is stiffening. Identify and evaluate career opportunities in the packaging industry which minimizes environmental pollution.
	C3	Listen to a food scientist or biotechnologist discuss new consumer trends and emerging careers to meet consumer demands.

(CONTINUED)

COURSE:	Food Science	UNIT: **Trends in Food Science**
COMPETENCY:	035.00 - C3	Investigate emerging trends in food science.
OBJECTIVE:	035.01 - C3	*Explore emerging careers in food science and biotechnology.(3)*

OUTLINE	BEHAVIOR	STRATEGIES
	C3	Read employment resources. Write for materials on the employment outlook regarding food science occupations for the next 5-10 years. Where are the projected jobs.
	C3	Prepare a bulletin board to educate your school community about the emerging careers in food science and biotechnology.
	C3	Develop a career ladder for a food science related career of your interest.
	C3	Select an emerging career in the food industry. Conduct an analysis of what employers would look for when hiring a person for this job. Write a report outlining the responsibilities, the necessary qualifications, and what an interview might consist of for this career.
	C3	Develop a list of areas of knowledge, skills, and attitudes that an individual desiring a career in food science should possess.

(CONTINUED)

COURSE:	Food Science	UNIT: **Trends in Food Science**
COMPETENCY:	035.00 - C3	Investigate emerging trends in food science.
OBJECTIVE:	035.01 - C3	*Explore emerging careers in food science and biotechnology.(3)*

OUTLINE	BEHAVIOR	STRATEGIES
	C3	Evaluate whether a career in food science or related field would be right for you.

RESOURCES:

Food Science and You, pp.236-373
Teacher's Resource Guide, pp.329-336

"Graduate Training for a Career in Industry", Food Technology,

SRA Occupational Brief No. 215
"Food Technologists," 1978

FORRCE (Informational literature on packaging waste and styrofoam containers)

"Biotechnology Work Force"

"Careers in Biotechnology"

"On the Job: Profiles of People at work in North Carolina's Biotechnology Industry"

Occupational Brief No.114
"Food Technologists," 1973

Information on Government Opportunities in Food Technology

"Food Science Careers" (Free Loan) Modern Films

"Jobs for the 90's" (Filmstrip) Sunburst Communications

"Careers in Food and Nutrition (Filmstrip) Glencoe

"An Introduction to Biotechnology"

COURSE:	Food Science	UNIT: **Trends in Food Science**
COMPETENCY:	035.00 - C3	Investigate emerging trends in food science.
OBJECTIVE:	035.02 - C3	*Research new technology as it relates to product development and consumer needs.(3)*

OUTLINE	BEHAVIOR	STRATEGIES
Research Trends in Food Science Product Development Consumer Needs	C3	Research properties of containers needed for commercial food packaging. Identify the advantages and disadvantages of each type.
	C3	View film/video on food product development. Explain why the number of new products increased due to technology.
	C2	Identify major food products that have grown in numbers more than others. Explain why the growth has occurred in the particular categories. Tell how well the public accepts new products.
	C3	Visit a grocery store and identify new products on the market. Write an analysis of the new products describing the appealing characteristics of the products, the type of consumers most likely to purchase it, suggestions for improvement if any, and price comparison.
	C3	Research new food products for persons with special dietary needs (i.e. high cholesterol, diabetes, obesity).

(CONTINUED)

COURSE:	Food Science	UNIT: **Trends in Food Science**
COMPETENCY:	035.00 - C3	Investigate emerging trends in food science.
OBJECTIVE:	035.02 - C3	*Research new technology as it relates to product development and consumer needs.(3)*

OUTLINE	BEHAVIOR	STRATEGIES
	C3	Define synthetic foods. Research new substitute and synthetic foods and their uses. Tell the extent to which consumers accept synthetic foods.
	C3	Explore the potential impact of biotechnology on agriculture and food systems.
	C3	Select one of the following new product developments and research it thoroughly. For additional information note the citations below: *Spray Dried Flavors*[1] *Ingredients for Cultures Dairy*[1] *Chemical Additives*[1] *Instant Nonfat Dry Milk*[1] *Natural Strawberry WONF Emulsion*[2] *Rice Syrup Solids*[2] *Encapsulated Food Ingredients*[2] *Natural Fat Flavor*[2] *Potato Starch*[3] *Cooked Meat Improver*[3] *Fat Replacer*[3] *Vegetable Starch*[3] *Beverages and Beverage Technology*[4]

(CONTINUED)

COURSE: Food Science UNIT: **Trends in Food Science**

COMPETENCY: 035.00 - C3 Investigate emerging trends in food science.

OBJECTIVE: 035.02 - C3 *Research new technology as it relates to product development and consumer needs.(3)*

OUTLINE	BEHAVIOR	STRATEGIES
	C3	Research advances in microwave food processing.[4]
	C3	Examine one of the following consumer trends and its impact on the food industry: * Significant changes in the social, economic, and demographic environment; * Population growth is slow and the percentage of older people is increasing; * Snack eating had increased and family meals have decreased; * Demand for environmentally friendly products; * Demand for eco-labeling * demands to address health, appearance of foods and convenience; *Demand to know more about the food we eat; *Willingness to pay for quality.
	C3	Research new preservatives in foods.

(CONTINUED)

COURSE:	Food Science	UNIT: **Trends in Food Science**
COMPETENCY:	035.00 - C3	Investigate emerging trends in food science.
OBJECTIVE:	035.02 - C3	*Research new technology as it relates to product development and consumer needs.(3)*

OUTLINE	BEHAVIOR	STRATEGIES
	C3	Research new products resulting from biotechnological applications (i.e. alteration of genes in fruits, vegetables, meats, eggs, and other products).
	C3	Prepare a bulletin board illustrating new technologies in food production, processing, or marketing.
	C3	Identify and research a company that produces innovative food products.

RESOURCES:

[1]"Products and Literature", Food Technology, 45(June 1991) p.138

[2]"Products and Literature", Food Technology, 46(Nov. 1992) p.162

[3]"Products and Literature", Food Technology, 46(June 1992)174-8

*All volumes of Food Technology Products and Literature Reports

"Carolina Genes" Newsletter
NC Center for Biotechnology

[4]"Hitting the Spot: Beverages and Beverage Technology, Food Technology, 46(July 1992) 70-79

"Social, Moral, and Ethical Issues in Food Biotechnology, Food Technology, 45(May 1991) pp.152-9

"Biotechnology: Sowing the Seeds for Better Agriculture" and "SEARCH Series on Biotechnology"
NC Center for Biotechnology

COURSE:	Food Science	UNIT: **Trends in Food Science**
COMPETENCY:	036.00 - C3P	Develop experiments in food science.
OBJECTIVE:	036.01 - C3P	*Use the scientific method to develop a procedure for an experiment.(2)*

OUTLINE	BEHAVIOR	STRATEGIES
Developing a Procedure for an Experiment	C3P	Brainstorm, read articles, and review the textbook to identify possible topics for experimental study.
Choosing a Topic Research the topic Narrow the focus of the topic Developing an Experiment	C3P	Select and research a topic. Narrow the focus of your topic to the allowable time frame. Specify the research problem to be investigated.
Hypothesis Title Procedure Data table Supplies and equipment	C3P	Develop a research hypothesis that will guide the experiment. State specifically the theory to be tested.
Writing the lab report	C3P	Determine the title of the experiment.
	C3P	Outline the steps of the procedure. Identify the variable(s).
	C3P	Develop the structure of the data table.
	C3P	Develop a format for analyzing the data and for writing the results.

RESOURCES:

Food Science and You, pp.352-363
Teacher's Resource Guide, pp.316-328

COURSE:	Food Science	UNIT: **Trends in Food Science**
COMPETENCY:	036.00 - C3P	Develop experiments in food science.
OBJECTIVE:	036.02 - C3P	*Conduct a food science experiment.(3)*

OUTLINE	BEHAVIOR	STRATEGIES
Conducting an Experiment Laboratory Safety Scientific Measurement Objective evaluation Subjective evaluation	C3P	Suggested topics for experimentation are listed below: * Create a by-product from a complex food; * Analyze the effects of water, temperature, and pH on the growth of microorganisms in food; * Compare disinfectants for various surface areas; * Develop a disinfectant for various surface areas; * Determine what factors cause corn to pop. Laboratory Experiment 22-1: Properties of Popping Corn. Food Science and You, p.361. * Determine if each sample of a solution has the same composition. * Which brand tortilla chip holds the most topping without breaking. * Which brand of ketchup had the most viscosity? * Does vitamin C enter potato water during cooking? * Which form of breakfast cereal stays crunchy the longest? * Which chewing gum holds it flavor the longest. * Which type of sweetner is the most soluble at 25 degrees Celsius.

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COURSE:	Food Science	UNIT: **Trends in Food Science**
COMPETENCY:	036.00 - C3P	Develop experiments in food science.
OBJECTIVE:	036.02 - C3P	*Conduct a food science experiment.(3)*

OUTLINE	BEHAVIOR	STRATEGIES
		* Based on pH levels answer the question, "Does the type of fruit in "real" fruit flavored yogurts affect the keeping quality of yougurt? * Determine whether white or frozen grape juice has the highest vitamin C levels. * Which brand of microwave popcorn gives the highest popping ratio to unpopped? * Which cooking oil gives the best quality french fries (soybean, canola, corn, olive, or safflower oil).

RESOURCES:

Food Science and You, pp.352-363
Teacher's Resource Guide, pp.316-328

COURSE:	Food Science	UNIT: **Trends in Food Science**
COMPETENCY:	036.00 - C3P	Develop experiments in food science.
OBJECTIVE:	036.03 - C3P	*Present experimental findings to the class.(3)*

OUTLINE	BEHAVIOR	STRATEGIES
Presentation of Experiments	C3P	Prepare a written report of the procedure and findings.
Hypothesis Procedures Results Special Notations	C3P	Develop a poster, pamphlet, handout, or transparency to use during the oral presentations. If time permits, illustrate various points of the experiment.
	C3P	Orally present the results of the experiment. Explain unexpected results. Identify modifications required for repeating the experiment. Explain what you would do differently. What factors account for the findings.

RESOURCES:

Food Science and You, pp.352-363
Teacher's Resource Guide, pp.316-328

"Say It Better: Fearless Public Speaking"
(Video) Learning Seed

"The Perfect Paragraph" (Filmstrip)
Learning Seed

RESOURCES

COURSE TEXTBOOKS

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The Politics of Food. (1992). Food Technology. 46, 58-63.

What do consumers think about irradiated foods? (1992). Food Safety Review.

INFORMATION SOURCES

A Handbook for Food Professionals
The Sugar Association, Inc.
1101 Fifth Street, NW Suite 600
Washington, D.C. 20005
1-202-785-1122

Coalition for Food Irradiation
605 14th St., NW
Suite 900
Washington, DC 20005

Cooperative Extension Service (county or state)
Ask for the Home Economist.

Council for Agricultural Science and Technology CAST
P.O. Box 1550
Iowa State University Station
Ames, IA 50010-1500

FORRCE (informational literature on packaging waste and styro containers)
P.O. Box 1465
Hamlet, North Carolina 28345

"Graduate Training for a Career in Industry"
Food Technology
221 North LaSalle Street
Chicago, IL. 60601

Health and Energy Institute
236 Massachusetts Ave., NE
Suite 506
Washington, DC 20002
202-543-1070

"Incredible Edible Egg"
North Carolina Egg Association
Raleigh, N.C.

Information on Government
Opportunities in Food Technology
U.S. Civil Service Commission
1900 E. Street N.W.
Washington, D.C.

North Carolina Biotechnology Center
15 T.W. Alexander Drive
P.O. Box 13547
Research Triangle Park, N.C. 27709
Helen Kreuzer, Ph.D., Educational Projects Director
919-541-9366 - FAX 919-990-9544

> "North Carolina's Biotechnology Work Force"
>
> "Educational Activities," Spring 1993
>
> *Carolina Genes* Newsletter (all issues). Topics include recent developments in agriculture, medicine, the environment, DNA, a lesson plan, North Carolina's Biotechnology work force, workshops, and educational materials.
>
> "An Introduction to Biotechnology"
>
> "On the Job: Profiles of People at Work in North Carolina's Biotechnology Industry"

Occupational Brief No. 114
"Food Technologists," 1973
Chronicle Guidance Publications, Inc.
Moravia, NY 13118

SRA Occupational Brief No. 215
"Food Technologists," 1978
Science Research Associates, Inc.
155 N. Wacker Drive
Chicago, IL 60606

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FILMSTRIPS

American School Publishers

"Special Topics in Chemistry"

Franklin Clay Films
P.O. Box 0v-2808
Costa Masa, California

"Metrics Made Easy"
"Food: It's Science, Your Future"
"Food Science Careers"
"The Perfect Paragraph"

Coronet MI Films/Video
Simon & Scheuster Co.
New York, New York

"Chemistry, Acids, Bases, and Salts"

Learning Seed
330 Telser Road
Lake Zurich, Illinois 60047

"What's in the Food?"
"Careers in Foods and Nutrition"

Modern Learning Aid (MOLA)
c/o Ward Natural Science

"Molecular Motion"

Sunburst Communications Inc.
39 Washington Avenue
P.O. Box 40
Pleasantville, N.Y. 10570-9971

"Jobs for the '90's"

VIDEOS

American School Publishers
MacMillan/McGraw-Hill
Princeton Road
Box 408
Hightstown, N.J. 08520-9377

"Basic Chemistry"
"Ethics: Code of Conduct"
"Food Poisoning"
"Lab Safety"
"Special Topics in Chemistry"
"What's in the Food"

Franklin Clay Films
P.O. Box OV-2808
Costa Masa, California 92628-2808

"Metrics Made Easy"

Learning Seed
330 Telser Road
Lake Zurich, Illinois 60047

"Level With Me"
"Say it Better: Fearless Public Speaking"
"What's in the Food?"
"Food Safety and Danger Zone"

North Carolina Biotechnology Center
15 T.W. Alexander Drive
P.O. Box 13547
Research Triangle Park, N.C. 27709
919-541-9366 - FAX 919-990-9544

"Search: Series On Biotechnology"

Produced for the North Carolina Biotechnology Center by N.C. State University, this 30-minute program describes for lay audiences five biotechnology research projects under way at companies and universities in North Carolina.

"Biotechnology: Sowing The Seeds For Better Agriculture"

Produced by the North Carolina Biotechnology Center, this 16-minute videotape describes the science, methodology, and regulatory procedures underlying the development of genetically engineered crops.

SOFTWARE

Learning Seed
330 Telser Road
Lake Zurich, Illinois 60047

"Understanding Food Labels"
"Weightcalc"

EMC PUBLISHING
300 York Avenue
St. Paul, Minnesota 55101

"Cal-Boom!" (IBM and Apple Format)
Students will be able to identify the relative energy values of a wide variety of foods.

"Inspector Pickright" (IBM and Apple Format)
Students will be able to identify the meal which has the higher sodium content and which food item in that meal contributes the most.

"The Daily Number" (IBM and Apple Format)
Students will balance calorie intake from food with calorie expenditure through daily activities and exercise.

EDUCATIONAL PACKETS

Adolescent Nutrition Resource Packet
Penn State Nutrition Center
Penn State University
417 E. Calder Way
University Park, PA 16801-5663
814-865-6323

> The packet includes background information for teachers, appropriate background information for adolescents, and examples of activities and teaching techniques to use with teenagers. The major categories include special nutrients for teens; weight control, exercise and sports nutrition; eating disorders; fat, cholesterol and sodium; artificial sweeteners; classroom activities.

Nutrition Science Experiments and Activities
Penn State Nutrition Center
College of Health and Human Development
417 East Calder Way
The Pennsylvania State University
University Park, PA 16801-5663

LABORATORY EXPERIMENTS

1. Acid-Base Indicators
2. Anatomy of a Hot Dog
3. Body Composition Estimation by Anthropometry
4. Body Composition — Density Demonstration
5. Bomb Calorimetry
6. Digestion
7. Enzyme (Rennin) Investigation
8. Experiments in Osmosis and Diffusion
9. Isolation of Caffeine
10. Testing for Vitamin C in Beverages

ACTIVITIES

1. Chemicals We Eat
2. Effect of Switching to Lower Fat Mild
3. Energy Balance
4. Fat Classification
5. Food Irradiation
6. Recycling Our Calories
7. Soft Drink Trivia
8. What's Your ADA for Nutrasweet.

SELF-ASSESSMENTS
Penn State Nutrition Center
College of Health and Human Development
417 East Calder Way
The Pennsylvania State University
University Park, PA 16801-5663
1-814-865-6323
Fax 1-814-865-5870

This packet of 11 assessments encourages the reader to take an active role in learning more about his or her food consumption. By completing these self-assessments employees will be able to examine how much sugar, fat, sodium, fiber and/or caffeine they are consuming. Other assessments such as vitamin/mineral supplement use, exercise,and food label reading will help employees improve their nutrition awareness and develop the skills needed to make changes.

Self-Assessment Topics

1. Caffeine
2. Calcium
3. Exercise Assessment
4. Fiber
5. Heart Healthy (Fat in Foods)
6. Label Reading
7. Sodium
8. Sugar
9. Variety
10. Vitamin/Mineral Supplements
11. Weight control/Eating Habits

Laboratory Experiments
Institute of Food Technologists
"What is Enzymatic Browning?"
"Experiments in food Science"

"Your Breakfast Chemicals"
Consumer Information
Manufacturing Chemists Association
1825 Conn. Ave., N.W.
Washington, D.C. 2009

Penn State Nutrition Center
College of Health and Human Development
417 East Calder Way
The Pennsylvania State University
University Park, PA 16801-5663

DISPLAY KITS

Each kit includes a statement of the display's educational objectives, instruction for setting up the display, either a black and white or colored poster, information cards (printed on colored, card-weight paper) that provide basic facts or instruct viewers in a self-guided ideal for classrooms, worksites, health fairs and waiting rooms.

Alcohol Display Kit
Fat Display Kit
Fiber Display Kit
Sodium Display Kit Sugar and Sweeteners Display Kit
Weight Control Display Kit
Sugar and Sweeteners Display Kit

SUPPLIES AND EQUIPMENT

Fisher Scientific
Fisher — EMD
Educational Materials Division
4901 W. LeMoyne Street
Chicago, IL 60650
(1-800-995-1177)
(1-312-378-7770) Fax

Sargent-Welch
911 Commerce Court
Buffalo Grove, Illinois 60089-2362
(708) 677-0600

NASCO
901 Janesville Avenue
P.O. Box 901
Fort Atkinson, Wisconsin 53538-0901
1-800-558-9595

Science Kit and Boreal Laboratories
777 East Park Drive
Tonawonda, New York 14150-6784
(716) 874-6020

> Great source for taste test papers to be used with taste testing and the evaluation of food.

Edmond's Scientific Company
101 East Glouchester Pike
Barrington, New Jersey 08007-1380
(609) 547-3488

> Specializes in scientific gadgets and other items (i.e. hand boiler for discussion on phase changes and controlled atmospheric pressure freeze-dried ice cream as used by astronauts.

Associated Microscope, Inc.
P.O. Box 1076
Elon College, North Carolina 27244-1076
(919) 578-3893

Frey Scientific
P.O. Box 131026
Cleveland, Ohio 44193-1223
(419) 589-1900